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BRYOLOGIA BRITANNICA;

CONTAINING

THE MOSSES OF GREAT BRITAIN AND IRELAND,

SYSTEMATICALLY ARRANGED AND DESCRIBED ACCORDING TO THE
METHOD OF BRUCH AND SCHIMPER,

WITH ILLUSTRATIVE PLATES:

BEING

A NEW (THIRD) EDITION,

WITH MANY ADDITIONS AND ALTERATIONS, OF

THE MUSCOLOGIA BRITANNICA

OF

MESSRS. HOOKER AND TAYLOR.

BY WILLIAM WILSON.

LONDON:
LONGMAN, BROWN, GREEN, AND LONGMANS.
1855.

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NOTE

BY THE

SURVIVING EDITOR OF THE "MUSCOLOGIA BRITANNICA."

My name, as the Originator of the "*Muscologia Britannica*," having, in conjunction with that of the late Dr. Taylor, so long been attached to the work bearing that title, it has been thought desirable that it should be retained in the title-page of the present edition: but it is a duty I owe to my excellent friend Mr. Wilson, and to the public, to say that all the additions and alterations, beyond what appear in the "*Second Edition, corrected and enlarged,* 1827," and in the "*Musci,*" by myself, of the Second Volume of the "*British Flora,*" are due to the knowledge, and perseverance, and industry of Mr. Wilson; and the additional and corrected figures are all from his accurate pencil.

Royal Gardens, Kew,
December, 1854.

W. J. HOOKER.

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INTRODUCTION.

When this work was undertaken, previous to the appearance of the *Bryologia Europæa*, little more was intended than a correct description of British species of mosses, and an indication of natural affinities, with as little disturbance as possible of the names of the genera given in the second edition of the *Muscologia Britannica*. A departure from this course was not taken until after grave deliberation, nor without a sense of its necessity; for it was feared that a natural arrangement, and the consequent change of generic names would much tend to discourage those who were only commencing the study of mosses; and on the appearance of the *Bryologia Europæa* it became doubly requisite to avoid any fundamental change in the classification and nomenclature which should not secure the approval of competent judges.

While utterly disclaiming servile imitation, or indolent escape from the labour of sedulous examination of every point connected with the subject of this work, we have adopted the system of Bruch and Schimper, because it appears to be founded upon a legitimate and philosophic basis, and because any attempt to set up a rival system would be as presumptuous as it is superfluous. Entertaining harmonious views, and grateful for the kindly intercourse which we have so long enjoyed with our honoured friend Dr. W. P. Schimper, the principal and surviving author of the *Bryologia Europæa*, we gladly acknowledge the excellence of that admirable work, wherein the principles of natural arrangement, imperfectly developed in the works of Hedwig, and of Bridel, are so well and maturely carried out and applied.

As the best apology to those who prefer the more simple artificial method of classification employed in the previous edition, and to render the study more easy to those who are only on the threshold, the plates illustrative of the artificial genera are retained, and an alphabetical list is given, with references to the modern genera which form the subject of the present work, and of the analytical and synoptical tables.

The following brief explanation of the principles of arrangement employed in this treatise must suffice. The artificial classification of the former edition had almost exclusive reference to the structure of the peristome, in conjunction with the form of the calyptra. The absence of a peristome was regarded as a positive character, and an essential difference was also assumed to exist between mosses with a single and those with a double peristome. The natural arrangement combines into one generic group all those species which have a stronger mutual resemblance of structure, in all parts, than to those of any other group; the sum of characters, and not any single character exclusively, being taken into account. The structure of the peristome is indeed still regarded as of primary importance; but when absent, or only partially developed, as in the case of *Encalypta*, &c., the deviation is regarded as non-essential; hence, it is believed that some of the genera of the *Bryologia Europæa* deferentially admitted into this work require to be remodelled. The form of the calyptra is generally, but not invariably, of importance. The texture of the leaves may not always have received due attention in this work. The insertion of the leaves, in those species where they are truly distichous, appears to constitute an essential character; thus the genus *Fissidens* is properly separated from *Dicranum*, notwithstanding the great similarity of the peristome. It seems still very desirable to preserve the acrocarpous and pleurocarpous mosses as separate groups, notwithstanding the existence of cladocarpous species, which form a connecting link, as in *Fissidens*, and although there are plausible grounds for the admission of *Anœctangium* as a pleurocarpous section of *Zygodon*.

In the determination of species, it will be seen that great stress is laid on the inflorescence. This feature is somewhat new and strange to British Bryologists, and may prove a stumbling-block to the learner, who is strongly advised not to shrink from the necessary work of dissection under the microscope. The species, in many instances, depend much on this character for a compendious and satisfactory definition, and long experience has shown that the distinctions thus obtained are permanent and essential, being accompanied by structural peculiarities less obvious, and therefore less available in a verbal definition of the species.

To facilitate the entrance of the learner into this study, a familiar example is here given of the structure and arrangement of the inflorescence and fructification.

If *Funaria hygrometrica* (common on almost every bank, and easily recognised) be examined in autumn, or early in winter, previous to the appearance of young fruitstalks, reddish stellate flowers will be found at the tops of the young shoots or stems. These are the barren or male flowers, and, on dissection in water, are found to consist of a cluster of oblong bladder-like vesicles (*antheridia*), mixed with jointed pellucid filaments (*paraphyses*), and surrounded by several rows of spreading leaves constituting the *perigonium.* The antheridia are at first filled with a semigelatinous mass of loose cellular tissue, of which each cellule contains a spermatozoid, composed of a spiral fibre with a very small oval or roundish corpuscle attached thereto, usually near the middle of the spire. At the period of maturity the antheridia burst at the top, and the contents escape with more or less of explosive action. Soon afterwards, the spermatozoids begin to gyrate rapidly within the cells, and at length, escaping from confinement, move about (in the water) in various directions. This motion is often continued for several hours. The empty antheridia are visible long afterwards, and assume a reddish-brown colour.

At the same season, and on the same individual, the fertile flower may be easily found by dissection at the apex of a young branch. The fertile flower consists of slender flask-shaped bodies (*archegonia*), mixed with jointed filaments (*paraphyses*), and surrounded by a cluster of erect leaves, which at length constitute the *perichætium.* The archegonia are somewhat longer and considerably more slender than the antheridia, and are filiform, except towards the base, where they are slightly tumid, and at the apex, where they are slightly expanded: a central canal extends from the apex to the swollen cavity near the base, where is lodged a roundish vesicle (the germ of the future fruitstalk and capsule); and in general only one of the archegonia comes to perfection, the rest being ultimately found in an abortive state attached to its base. The perfect archegonium soon becomes enlarged and distended by the increase in bulk of the contained vesicle, and is at length torn asunder at an horizontal fissure near the base, the upper portion being converted into the *calyptra*, and the base into the *vaginula.* The rudimentary vesicle is now converted into a fruitstalk, having its tapering base inserted and firmly fixed in the vaginula, and its apex sheathed by the young calyptra. When the fruitstalk has attained its full length, and not before, its apex swells and becomes changed into the capsule. The capsule contains a central column (*columella*), around which the *spores* (analogous to seeds) are generated within a membranous sac (*sporular sac*), which lines the cavity formed by the external walls of the capsule. The mouth of the capsule is closed up at first by the lid or *operculum*, and an intermediate coloured ring (*annulus*), composed of large cellular tissue, which, by its hygrometric action, causes the lid to fall off from the ripe capsule, disclosing the beautiful peristome, whose hygrometric action regulates the escape of the spores. The peristome is double, the outer one being a continuation of the inner wall of the capsule (called the *thecal membrane*), and the inner one a continuation of the sporular sac. At this period the short branch which bore the fertile flower is much elongated, and overtops and conceals the barren flower now apparently at the base of the stem. In this example, the two kinds of flowers are separated; but in many mosses the antheridia and archegonia are intermixed in the same flower, *e.g.* in *Bryum cernuum* and other species, common on walls, and formerly confounded with *B. cæspiticium*, but easily distinguished from that species by means of the inflorescence. Illustrations of the antheridia and archegonia, magnified forty times, are given at Tab. LI. (*Mnium subglobosum*), and Tab. XLIX. (*Bryum intermedium*).

Of the function of the antheridia nothing is known by actual observation; but it is a well established fact that, wherever they are absent, fruit is never produced from the archegonia. The dioicous species of *Hypna* are usually destitute of capsules from this cause, or from the absence of archegonia, in any given district; and a little pains bestowed in examining the nature of the inflorescence may often save much useless toil in the search for fruit, or may lead to its discovery.

The species described in this work, exclusive of some whose nativity as British is very doubtful, amount to 444, of which only 290 are described in the Second Edition of *Musc. Brit.* Nearly all the newly-described species have been illustrated by figures, and the illustrations which originally appeared in *Musc. Brit.*, and which have been transferred to the present work, have been corrected when necessary. In most cases the species of *Hypnum* are represented only by magnified figures of the leaves; otherwise the price of the book must have been much increased by the additional number of plates.

Of the uses of Mosses in the economy of creation, very little is known; but they are often the necessary precursors of a higher order of vegetables, for which they prepare a soil, by retaining amongst their matted branches the drifting sand and dust, in places which would otherwise remain bare and sterile. They afford refuge in winter, and food as well as lodgment in summer, to innumerable insects. In a living state they are useful as package for the transmission of growing plants, not being apt to grow mouldy, and retaining their vitality and moisture for a long period. Many species of *Hypnum* when dried are highly elastic, and suitable for packing delicate and fragile articles; and a pillow stuffed with *Hypnum* will explain, if it may not have originally suggested, the name from the Greek word signifying sleep. To the traveller in the dense and trackless forests of North America, they are pretty sure guides to the points of the compass, growing on the northern sides of the trunks of trees, where they find most shade and moisture.

For the sake of brevity, references to the pages of the authors cited have been generally omitted, and only the figures indicated; and the figures of Dillenius' *Historia Muscorum*, indiscriminately subjoined to names subsequently given by other authors, are cited without the names or descriptive phrases. In almost every case where Smith, *English Botany*, is mentioned, the *Flora Britannica* of the same author must be understood as included.

The geographical distribution of mosses will more properly form the subject of a separate work, our present object being to furnish the student, in as compendious a form as possible, with the means of identifying the indigenous species of a tribe of plants often so diminutive in size and so unpretending in colour as to escape the notice of any but an educated eye, but which, when examined by the aid of the microscope, display such exquisite symmetry and beauty as to call forth the admiration and delight of the beholder ; — delight, not in the outward senses only ; for, as good old Gerarde truly says, "the principal delight is in the mind, singularly enriched with the knowledge of these visible things, setting forth to us the invisible wisdom and admirable workmanship of Almighty God ;" and recalling the fervid exclamation of the Psalmist, "O Lord, how manifold are thy works ! in wisdom hast thou made them all : the earth is full of thy riches."

Our thankful acknowledgments are tendered to those kind friends who have supplied materials for this work, and whose names appear in connection with their discoveries and communications.

ADVERTISEMENT.

Illustrative sets of specimens of about 400 of the species described in this work may be had at the rate of twenty shillings per hundred. The specimens are generally in good condition, it having been the endeavour of the collector, for many years past, to obtain them with fructification at the proper season of maturity. Address, W. Wilson, Manchester Road, Warrington.

ADDENDA.

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Sphagnum compactum.

This species proves to be monoicous. The antheridia are found on the slender, pendent branches, and are conspicuous from their orange colour. Their unusual position may have caused them to be overlooked until this part of the work had been printed; but they most probably disappear or fall away before the fruit ripens. Our monoicous specimens were gathered on the 6th of May last, and show the fructification in a very early stage.

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9*. *Bryum Marratii* H. & Wils. (*Marrat's blunt-leaved Thread Moss*); monoicous; stems gregarious, sparingly radiculose; leaves more or less spreading, concave, elliptical, obtuse, entire, nerve vanishing below the apex; fruitstalk long and slender; capsule small, pendulous, roundish-turbinate; lid conical, rostellate; inner peristome imperfect, adhering to the outer teeth. (Tab. XXXII. b.)

Hab. On the flat sandy shore at Southport, Lancashire; first found by *Mr. W. M. Marrat*, of Liverpool, June 1854. Fr. Sept.

Stems about ¼ in. long, or more. Leaves rather large, of soft texture, light green, subpellucid, scarcely reflexed in the margin, those of the perichætium narrower and longer, suberect. Fruitstalk about 1 inch long, reddish. Capsule roundish, tapering into the fruitstalk, when ripe reddish-brown, at first olive and shining, the mouth small. Lid about ⅓ as long as the capsule, more or less rostellate. Annulus large. Teeth of the outer peristome deep red, connivent into a cone, unaltered when dry, trabeculate externally. Inner peristome imperfect, adherent to the outer teeth. Spores yellowish, rather large. Inflorescence monoicous, often synoicous.

This very remarkable species was at first supposed to be an accidental form of *B. latifolium* of Bryol. Europ., the figure and description of which are ambiguous; but the true species, so called, has since been found growing in company with this, and is now ascertained to be essentially different, though nearly allied. *B. Marratii* is readily distinguished from *B. latifolium* by the small roundish capsule, rostellate lid, red peristome (much resembling that of *Conostomum*), and narrower obtuse leaves with a shorter and thinner nerve.

9**. *Bryum calophyllum* R. Br. (*broad-leaved Thread-Moss*); monoicous; stems gregarious, sparingly radiculose; leaves erectopatent, concave, roundish-ovate, entire, nerved almost to the apex; capsule elliptic-oblong, pendulous; lid short, convex, more or less apiculate. (Tab. XXXIII. g.)

B. calophyllum *R. Brown* in Parry's 1st & 2d Voyages.
B. latifolium *Bryol. Europ.* Monogr. t. 4.

Hab. On the flat sandy shore at Southport, in company with *B. Marrattii*, sparingly; found by *Mr. Marrat* of Liverpool. Fr. Sept.

Much resembling the last in size and general habit; but more robust. Stems reddish. Leaves of a darker green colour, of stouter texture, moderately spreading in the fertile plant; widely spreading on the barren shoots, which are longer than the fertile stems; wider and less obtuse than in *B. Marratii*, tapering to an almost acute point; more or less recurved in the margin towards the base; nerve stronger, reddish or purplish, extending very nearly to the apex. Fruitstalk shorter and thicker, reddish. Capsule dull reddish, not glossy, oblong-oval, not tapering at the neck, the mouth larger. Lid short, not $\frac{1}{4}$ as long as the capsule. Annulus large. Teeth of the outer peristome yellowish-brown, perforated at the base, trabeculate internally. Inner peristome free, with narrow perforated processes, the cilia mostly absent, but sometimes present and appendiculate. Spores green, larger.

Much difficulty has been experienced in determining this species; our specimens of *B. calophyllum*, from Igloolik, being unripe, and that of *B. latifolium*, from M. Bruch, too scanty for dissection. The leaves of *B. calophyllum* are usually more obtuse and less tapering than in *B. latifolium*, but there seems to be no essential difference, and in the capsule and lid they perfectly coincide.

These two species form an intermediate *monoicous subdivision* of Sect. II., and rank between *B. Ludwigii* and *B. lacustre*.

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10*. *Bryum Warneum* Blandow (*Waren Thread-Moss*); monoicous or synoicous; loosely tufted; stem branched; branches short; innovations more or less flagelliform; leaves erecto-patent, ovate-acuminate, loosely reticulated, margin recurved, nerve continued to the serrulate apex; capsule pendulous, pear-shaped, ventricose; lid small, convex, apiculate; inner peristome with very narrow processes and short rudimentary cilia. (TAB. XII. a.)

B. Warneum *Blandow. Bridel. Bryol. Europ.* Monogr. t. 5. *C. Müller.*
Pohlia Warenensis *Schwaegr.* Suppl. t. 236. *Hübener.*

Hab. In muddy or sandy places at the sides of rivers, ponds, &c. Tents Muir, Fife, with *B. pallens*, August 1853, *W. M. Ogilvie.* On the flat sandy shore at Southport, *Marrat & Wilson.*
Fr. August, Sept.

Resembling *B. lacustre* in aspect and in general character; and certainly not distinct in the inflorescence. Leaves narrower, more acuminated, less concave; margin more widely recurved; nerve more opaque, continued to the apex. Capsule longer, pale brown, the contracted mouth surrounded when dry with a curious glossy border. Inner peristome with narrower processes, adhering to the outer teeth, straw-coloured or orange. Spores large, greenish. Fruitstalk long and slender.

ANALYTIC KEY TO THE GENERA.

1.	Fructification terminal. 2.	
	Fructification lateral. 80.	
2.	Fruit terminal on a stem. 3.	
	Fruit terminal on a lateral branch. 78.	
3.	Capsule without a deciduous lid. 4.	
	Capsule with a deciduous lid. 6.	
4.	Capsule opening by slits - - -	*Andreæa.* I.
	Capsule bursting irregularly. 5.	
5.	Capsule sessile; spores large; calyptra adhering to the vaginula - -	*Archidium.* III.
	Capsule pedicellate; spores small; calyptra loose - - - -	*Phascum.* IV.
6.	Peristome wanting. 7.	
	Peristome present. 17.	
7.	Annual, or biennial; leaves reticulated, lax. 8.	
	Perennial; leaves of close firm texture. 11.	
8.	Capsule oval; lid rostrate - -	*Pottia.* XXI.
	Capsule obovate; lid short, flattish. 9.	
9.	Leaves vertically distichous - -	*Schistostega.* LXXI.
	Leaves inserted, spirally, in several rows. 10.	
10.	Calyptra large, inflated; barren flower discoid - - - - -	*Physcomitrium.* LX.
	Calyptra small; antheridia naked, axillary - - - - - -	*Oedipodium.* LXX.
11.	Lid adhering to the columella; capsule subexserted - - - -	*Stylostegium.* XII.
	Lid not adhering to the columella. 12.	
12.	Annual or biennial, minute; leaves setaceous - - - - -	*Anodus.* XI.
	Perennial, tall; leaves not setaceous. 13.	
13.	Capsule globose. 14.	
	Capsule oval or cylindrical. 16.	
14.	Capsule on a long fruitstalk; calyptra dimidiate - - - - -	*Bartramidula.* LXI.
	Capsule more or less immersed; calyptra mitriform. 15.	
15.	Barren flower axillary; capsule immersed, sessile - - - -	*Hedwigia.* XXX.
	Barren flower terminal; capsule on short pedicel - - - -	*Hedwigidium.* XXXI.

16.	Calyptra small, dimidiate	*Gymnostomum.* V.
	Calyptra large, cylindrical, covering the capsule	*Encalypta.* XXIX. (partly).
17.	Peristome single. 18.	
	Peristome double. 63.	
18.	Peristome a conical plaited membrane	*Diphyscium.* XLII.
	Peristome divided into teeth. 19.	
19.	Teeth 4. 20.	
	Teeth 16, or more. 21.	
20.	Perennial, caulescent	*Tetraphis.* XXXIX.
	Annual; stem none	*Tetrodontium.* XL.
21.	Teeth 16. 22.	
	Teeth 32. 55.	
22.	Teeth simple, scarcely cloven or perforated. 23.	
	Teeth distinctly cloven. 46.	
23.	Teeth paired. 24.	
	Teeth equidistant. 30.	
24.	Calyptra mitriform. 25.	
	Calyptra dimidiate. 27.	
25.	Calyptra plicated	*Orthotrichum.* XXXVII. (partly.)
	Calyptra smooth. 26.	
26.	Calyptra inflated below, covering the capsule	*Glyphomitrium.* XXXV.
	Calyptra small, not inflated	*Splachnum.* LXVI.
27.	Capsule furrowed; leaves with close dot-like areolæ	*Zygodon.* XXXVIII.
	Capsule smooth; leaves reticulated. 28.	
28.	Capsule with a distinct apophysis; calyptra not inflexed	*Tetraplodon.* LXVII.
	Capsule with obscure apophysis; calyptra inflexed at base. 29.	
29.	Leaves obtuse, entire; teeth incurved when dry	*Dissodon.* LXIX. (partly.)
	Leaves acuminate, serrate; teeth reflexed when dry	*Tayloria.* LXVIII.
30.	Teeth very short, truncated	*Brachyodus.* IX.
	Teeth longer, tapering or acute. 31.	
31.	Teeth united at top into a cone	*Conostomum.* LXIII.
	Teeth free at the top. 32.	
32.	Calyptra mitriform. 33.	
	Calyptra dimidiate. 38.	
33.	Teeth broad. 34.	
	Teeth narrow, longer, more frequently cloven. 36.	
34.	Capsule immersed	*Schistidium.* XXXII.
	Capsule pedicellate. 35.	
35.	Calyptra smooth	*Grimmia.* XXXIII.
	Calyptra furrowed	*Ptychomitrium.* XXXVI.
36.	Perennial, cæspitose; fruitstalk straight	*Racomitrium.* XXXIV.
	Annual or biennial, gregarious; leaves setaceous; fruitstalk geniculate	*Campylostelium.* VIII.

37.	Capsule symmetrical, pyriform or oval. 38.	
	Capsule oblique, globose. 44.	
38.	Calyptra inflated below	*Entosthodon.* LIX.
	Calyptra not inflated. 39.	
39.	Calyptra inflexed at the base	*Dissodon.* LXIX. (partly).
	Calyptra not inflexed. 40.	
40.	Capsule globose, oblique. 41.	
	Capsule oval or pyriform, symmetrical. 42.	
41.	Stem scarcely any; annual; leaves small and few	*Discelium.* LXV.
	Stem tall; perennial, cæspitose; leaves numerous	*Catoscopium.* LXIV.
42.	Capsule smooth. 43.	
	Capsule striated	*Rhabdoweissia.* VII.
43.	Capsule turbinate or pyriform. 44.	
	Capsule oval. 45.	
44.	Annual or biennial, gregarious; leaves setaceous	*Seligeria.* X.
	Perennial, cæspitose; leaves not setaceous	*Blindia.* XIII.
45.	Annual or biennial; leaves of lax texture	*Anacalypta.* XXII.
	Perennial; leaves of close texture	*Weissia.* VI.
46.	Fruitstalk curved. 47.	
	Fruitstalk straight. 48.	
47.	Capsule furrowed; calyptra fringed at the base	*Campylopus.* XX.
	Capsule smooth; calyptra not fringed at base	*Dicranodontium.* XIX.
48.	Capsule symmetrical, erect; leaves subflaccid	*Desmatodon.* XXIII.
	Capsule irregular; leaves of firmer texture. 49.	
49.	Leaves vertically distichous; equitant	*Fissidens.* LXXII.
	Leaves inserted in several rows. 50.	
50.	Leaves spongy, with large cellules in a double layer	*Leucobryum.* XVII.
	Leaves not spongy, cellules small, in a single layer. 51.	
51.	Lid short, conical	*Ceratodon.* XVIII.
	Lid rostrate. 52.	
52.	Teeth irregular, short, connivent	*Cynodontium.* XV.
	Teeth regular, longer, more or less spreading. 53.	
53.	Young calyptra angular at base; teeth perforated	*Blindia.* XIII.
	Young calyptra not angular. 54.	
54.	Capsule erect, contracted below the mouth; fruitstalk short	*Arctoa.* XIV.
	Capsule mostly oblique or cernuous; fruitstalk long	*Dicranum.* XVI.

55. Teeth free, long, and slender. 56.
Teeth connected by a tympanum, short, obtuse. 60.

56. Leaves distichous - - - - *Distichium.* XXIV.
Leaves inserted in several rows. 57.

57. Teeth erect, straight, not contorted. 58.
Teeth contorted. 59.

58. Teeth fragile, deciduous - - - *Didymodon.* XXV.
Teeth persistent - - - - *Trichostomum.* XXVI.

59. Capsule on a long fruitstalk - - *Tortula.* XXVII.
Capsule immersed or shortly pedicellate - - - - - *Cinclidotus.* XXVIII.

60. Capsule angular, with a distinct apophysis - - - - - *Polytrichum.* XLVI.
Capsule not angular. 61.

61. Calyptra very hairy; leaves firm, much lamellated - - - - - *Pogonatum.* XLV.
Calyptra almost naked. 62.

62. Leaves crisped when dry; columella not angular - - - - *Atrichum.* XLIII.
Leaves incurved when dry; columella winged - - - - - *Oligotrichum.* XLIV.

63. Inner peristome a plicated conical membrane - - - - - *Buxbaumia.* XLI.
Inner peristome not conical. 64.

64. Outer teeth paired. 65.
Outer teeth equidistant. 66.

65. Calyptra mitriform - - - - *Orthotrichum.* XXXVII.
Calyptra dimidiate - - - - *Zygodon.* XXXVIII.

66. Calyptra large, cylindrical, covering the capsule - - - - - *Encalypta.* XXIX. (partly).
Calyptra smaller, dimidiate. 67.

67. Calyptra inflated at base, rather large *Funaria.* LVIII.
Calyptra not inflated, rather small. 68.

68. Calyptra inflexed at the base; outer teeth short. 69.
Calyptra not inflexed at base; outer teeth long. 70.

69. Leaves loosely reticulated - - *Amblyodon.* LVII.
Leaves of firm close texture, narrow - *Meesia.* LVI.

70. Capsule striated. 71.
Capsule smooth. 72.

71. Capsule globose; leaves papillose, reticulated - - - - - *Bartramia.* LXII.
Capsule oval-oblong; leaves closely dotted - - - - - *Aulacomnion.* XLVIII.

72. Leaves very narrow, setaceous, or linear. 73.
Leaves wider. 74.

73. Annual, without innovations; inner peristome as in *Bryum* - - - *Leptobryum.* L.
Stem with innovations; inner peristome without cilia - - - *Orthodontium.* XLIX.

74. Capsule inclined or suberect. 75.
Capsule cernuous or pendulous. 76.

75.	Inner peristome of 64 filiform segments variously united	*Timmia.* XLVII.
	Inner peristome of 16 segments, without cilia	*Paludella.* LV.
76.	Barren flower gemmiform or naked	*Bryum.* LI.
	Barren flower discoid; leaves large. 77.	
77.	Inner peristome with 16 segments and intermediate cilia	*Mnium.* LII.
	Inner peristome cupuliform	*Cinclidium.* LIII.
78.	Capsule sessile on a stalked receptacle; peristome none	*Sphagnum.* II.
	Capsule pedicellate on a sessile receptacle; peristome present. 79.	
79.	Peristome of 16 simple teeth	*Mielichhoferia.* LIV.
	Peristome of 16 bifid teeth	*Fissidens.* LXXII. (partly).

PLEUROCARPOUS.

80.	Peristome none	*Anœctangium.* LXXIII.
	Peristome present. 81.	
81.	Inner perist. obscure, rudimentary. 82.	
	Inner peristome evident. 84.	
82.	Outer teeth simple; calyptra small. 83.	
	Outer teeth bifid or perforated; calyptra large; fruitstalk short	*Leucodon.* LXXIV.
83.	Capsule on a very short pedicel; calyptra hairy	*Leptodon.* LXXVI.
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86.	Inner peristome 16 cilia, free to the base. 88.	
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Alphabetic List of the Genera of Mosses named in "Muscologia Britannica" by Hooker and Taylor, Ed. 2., and in Hooker's "British Flora," showing the corresponding Genera of the present Work.

The number appended to each name indicates the number of the genus, as it stands in the systematic arrangement in each work.

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ZYGODON, XXIV. Zygodon, 38.

The following genera are additions to the known mosses of Britain since the publication of *Muscol. Britannica :*—

Bartramidula, 61. Cinclidium, 53. Dicranodontium, 19. Cylindrothecium, 81. Orthodontium, 49. Paludella, 55.

BRITISH MOSSES.

SYNOPSIS OF THE GENERA.

SECT. I. ACROCARPI. *Fruit terminal.*

(Or, in a few instances, *cladocarpous.* See Sect. I. *b.* CLADOCARPI, for a separate list.)

SUBSECTION A. *Capsule without a deciduous lid.*

* *Capsule bursting irregularly.*

3. ARCHIDIUM. *Capsule* sessile, globose; *calyptra* irregularly torn in the middle; *spores* large; *stem* perennial.
4. PHASCUM. *Capsule* very shortly pedicellate; *calyptra* falling away entire; *spores* small; *stem* annual.

** *Capsule bursting regularly.*

1. ANDRÆA. *Capsule* opening by longitudinal slits, sessile on a stalked vaginula.

SUBSECTION B. *Capsule with a deciduous lid.*

DIVISION I. *Peristome none.* GYMNOSTOMI.

* *Capsule sessile on a stalked vaginula.*

2. SPHAGNUM. *Capsule* globose; *calyptra* as in ARCHIDIUM. (Cladocarpous).

** *Capsule pedicellate; vaginula sessile.*

a. *Capsule* cylindrical; lid with a straight beak; calyptra mitriform.

29. ENCALYPTA (partly). *Calyptra* very large, entirely covering the *capsule*, subulato-cylindrical.

b. *Capsule* oval; lid obliquely rostrate; calyptra dimidiate.

5. GYMNOSTOMUM. Perennial; *leaves* of close firm texture.

21. POTTIA. Annual, or biennial; *leaves* rather succulent, with lax areolæ.

c. *Capsule* roundish-pyriform; lid obliquely rostrate.

12. STYLOSTEGIUM. *Capsule* subexserted; *columella* adhering to the lid; perennial; *leaves* channelled, secund.

11. ANODUS. *Capsule* pedicellate; *columella* free; annual, or biennial; *leaves* setaceous, erect.

d. *Capsule* obovate, or clavate; lid plane, or conical; leaves loosely reticulated.

† Calyptra mitriform.

71. SCHISTOSTEGA. *Leaves* vertically distichous, nerveless; *calyptra* very small.

69. PHYSCOMITRIUM. *Leaves* spreading every way, nerved, acute; *calyptra* large, inflated below; *barren flower* discoid.

†† Calyptra dimidiate.

70. OEDIPODIUM. *Leaves* succulent, broad, obtuse; *capsule* with a long tapering apophysis resembling a fruitstalk.

e. *Capsule* globose; lid almost plane.

† Calyptra conico-mitriform, small; leaves nerveless.

30. HEDWIGIA. *Barren flower* axillary; *capsule* subsessile, immersed.

31. HEDWIGIDIUM. *Barren flower* terminal; *stem* stoloniferous; *leaves* plicato-striate; *capsule* shortly pedicellate, subexerted.

†† Calyptra dimidiate; leaves nerved.

61. BARTRAMIDULA. *Capsule* on a long pedicel, drooping; *flowers* synoicous.

DIVISION II. *Peristome single.*

SUBDIVISION I. *Calyptra mitriform.*

† *Calyptra plicato-striate.*

a. Teeth 4.

39. TETRAPHIS. Perennial, caulescent, cæspitose.

40. TETRODONTIUM. Annual, *stem* none, gregarious; *leaves* few, very minute.

b. Teeth 16, equidistant.

36. PTYCHOMITRIUM. *Teeth* bifid; *calyptra* subulato-mitriform, shorter than the capsule.

c. Teeth 16, in pairs.

35. GLYPHOMITRIUM. *Calyptra* ventricose, entirely covering the roundish capsule, contracted at the base.

37. ORTHOTRICHUM (partly). *Calyptra* campanulate, not contracted at the base, nearly covering the oblong or obovate capsule.

†† *Calyptra smooth, not plicate.*

a. Teeth 16, equidistant.

‡ Perennial, caulescent, cæspitose.

29. ENCALYPTA (partly). *Calyptra* large, subulato-cylindrical, entirely covering the capsule.

32. SCHISTIDIUM. *Calyptra* small, conico-mitriform; *capsule* immersed, subsessile; *columella* adhering to the deciduous lid.

33. GRIMMIA. *Calyptra* as in the last (in a few instances subdimidiate); *capsule* pedicellate; *columella* free; *lid* rostellate.

34. RACOMITRIUM. *Calyptra* larger, subulato-mitriform, the subulate part solid and subpapillose; *capsule* oblong; *lid* subulate, straight; *leaves* with sinuous areolæ.

‡‡ Annual or biennial, gregarious; leaves setaceous.

8 CAMPYLOSTELIUM. *Calyptra* conico-subulate, small; *capsule* oblong, smooth; *fruitstalk* geniculate.

9. BRACHYODUS. *Calyptra* conico-submitriform; *capsule* striated, on a straight fruitstalk; *teeth* very short, truncate.

β. Teeth 16, in pairs, plane, reflexed when dry.

66. SPLACHNUM. *Calyptra* conico-mitriform, small; *capsule* apophysate.

γ. Peristome a conical plicated membrane.

42. DIPHYSCIUM. *Calyptra* small, conical; *capsule* very large, sessile.

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SUBDIVISION II. *Calyptra dimidiate.*

a. *Calyptra inflexed at the base, at first conico-mitriform; capsule clavato-pyriform; teeth* 16, *plane, more or less paired, marked with a medial line; leaves loosely reticulated as in* SPLACHNUM.

69. DISSODON. *Barren flower* gemmiform; *leaves* obtuse, entire; *teeth* incurved when dry (equidistant in *D. splachnoides*).

68. TAYLORIA. *Barren flower* capituliform; *leaves* acuminate, serrated; *teeth* reflexed when dry.

b. *Calyptra not inflexed at the base, dimidiate.*

* *Teeth in* 8 *pairs, reflexed when dry.*

67. TETRAPLODON. *Capsule* oval, with a distinct apophysis; *leaves* loosely reticulated, acuminate.

38. ZYGODON (partly). *Capsule* clavato-pyriform, furrowed; *leaves* minutely dotted.

** *Teeth* 16, *equidistant, simple, or nearly so.*

‡ Capsule pyriform, or oval, erect or inclined.

59. ENTOSTHODON. *Capsule* pyriform-obovate, erect; *calyptra* inflated below, large; *leaves* loosely reticulated.

54. MIELICHHOFERIA. *Capsule* pyriform, inclined; *calyptra* small, not inflated; *leaves* as in BRYUM. (Cladocarpous.)

13. BLINDIA. *Capsule* turbinate, erect; *calyptra* angular at the base; *fruitstalk* short; *leaves* as in DICRANUM; perennial, cæspitose.

10. SELIGERIA. *Capsule* roundish-pyriform, smooth; *calyptra* small; *leaves* setaceous; *stems* annual or biennial, gregarious.

9. BRACHYODUS. *Capsule* oval, erect, striated; *teeth* very short, truncate; (calyptra submitriform;) *leaves* setaceous; *stems* annual or biennial, gregarious.
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7. RHABDOWEISSIA. *Capsule* oval, striated, wide-mouthed; *teeth* lanceolate; *leaves* channelled, lax; *stems* perennial, cæspitose.

6. WEISSIA. *Capsule* oval or oblong, smooth; *teeth* lanceolate; *leaves* of close texture; *stems* perennial, cæspitose.

22. ANACALYPTA. *Capsule* as in the last; *leaves* rather succulent, with lax areolæ, as in POTTIA; *stem* annual or biennial.

‡‡ Capsule globose, nearly horizontal.

65. DISCELIUM. *Stem* scarcely any, annual, gregarious; *leaves* minute, few, reticulated.

64. CATOSCOPIUM. *Stems* perennial, cæspitose; *leaves* numerous, of firm texture, nerved.

63. CONOSTOMUM. *Stems* as in the last; *teeth* united at the summit into a cone; *habit* as in BARTRAMIA.

*** *Teeth* 16, *deeply bifid, equidistant.*

‡ Capsule erect, symmetrical.

23. DESMATODON. *Capsule* oval, or oblong; *lid* rostellate; *leaves* of soft texture, broad, papillose at the back; *stem* perennial.

‡‡ Capsule suberect, rather unequal.

15. CYNODONTIUM. *Capsule* smooth, pyriform-obovate, unequal; *lid* rostrate; *teeth* connivent, irregular, fragile; *leaves* of firm texture; *stem* perennial.

14. ARCTOA. *Capsule* striated, when dry contracted below the wide mouth; *fruitstalk* short; *teeth* plane, not evidently barred; *leaves* as in DICRANUM.

‡‡‡ Capsule cernuous or inclined, unequal.

16. DICRANUM. *Capsule* mostly cernuous, smooth or striated; *lid* rostrate; *fruitstalk* long; *teeth* distinctly barred; *leaves* of close texture, nerved, more or less secund.

17. LEUCOBRYUM. *Capsule, lid,* and *peristome,* as in DICRANUM; *leaves* spongy, composed of a double layer of loose cellular tissue; *nerve* indistinct.

72. FISSIDENS. *Teeth* with divergent geniculate segments; *leaves* vertically distichous. (Some of the species are cladocarpous.)

18. CERATODON. *Capsule* subcylindrical, unequal; *lid* short, conical; *teeth* cloven almost to the base, the segments connected by trabeculæ, composed of two differently coloured laminæ.

‡‡‡‡ Capsule on an arcuate fruitstalk.

20. CAMPYLOPUS. *Capsule* striated, unequal; *fruitstalk* arcuate; *calyptra* fringed at the base; *nerve* of the leaf broad.

19. DICRANODONTIUM. *Capsule* smooth, symmetrical; *fruitstalk* arcuate; *calyptra* not fringed at the base.

**** *Teeth* 32, *in pairs, narrow or filiform.*

25. DIDYMODON. *Capsule* oblong, symmetrical, erect; *teeth* very fragile and irregular. Habit of TRICHOSTOMUM.

26. TRICHOSTOMUM. *Capsule* as in the last; *teeth* persistent, filiform, erect or inclined, composed of a single layer of cellules.

24. DISTICHIUM. *Capsule* as in the preceding; *teeth* filiform; *leaves* distichous, setaceous from the sheathing base.

27. TORTULA. *Capsule* oblong, erect; *teeth* contorted, composed of a double layer of differently coloured cellules.

28. CINCLIDOTUS. *Capsule* immersed or shortly pedicellate; *teeth* contorted, anastomosing at the base.

***** *Teeth* 32 *or* 64, *equidistant, short, obtuse, connected at their apices by a tympanum formed of the dilated apex of the columella; nerve of the leaf covered with vertical lamellæ.*

‡ Capsule not angular; teeth 32.

43. ATRICHUM. *Calyptra* almost naked; *columella* round; *leaves* much crisped when dry, not sheathing at the base; *lamellæ* few; *nerve* narrow.

44. OLIGOTRICHUM. *Calyptra* slightly setose at the apex; *columella* winged; *leaves* firmer, sheathing at the base; *nerve* wider; *lamellæ* more numerous.

45. POGONATUM. *Calyptra* very hairy; *capsule* without angles, scarcely strumose; *leaves* rigid, densely lamellated; *nerve* thick and broad.

‡‡ Capsule angular; teeth 64, rarely 32.

46. POLYTRICHUM. *Calyptra* very hairy; *capsule* angular, with a distinct struma at the base; *leaves* as in the last.

DIVISION III. *Peristome double.*

* *Capsule plano-convex.*

41. BUXBAUMIA. *Capsule* large; *outer peristome* irregular, cellular; *inner peristome* a conical plicated membrane; *calyptra* small, subconical.

** *Capsule cylindrical.*

29. ENCALYPTA (partly). *Outer peristome* of 16 narrow erect teeth; *inner* of 16 cilia; *calyptra* large, completely covering the capsule, subulato-cylindrical.

*** *Capsule oblong.*

37. ORTHOTRICHUM (chiefly). *Outer peristome* of 16 short teeth, in pairs; *inner* of 8 or 16 cilia; *calyptra* mitriform, plicato-striate.

**** *Capsule obovate, unequal, mouth oblique.*

58. FUNARIA. *Outer teeth* 16, oblique; *inner teeth* 16, opposite to the outer teeth; *calyptra* inflated below.

57. AMBLYODON. *Outer teeth* 16, short, obtuse, erect; *inner peristome* a membrane divided halfway into 16 narrow carinate processes without intermediate cilia; *calyptra* inflexed at the base; *leaves* loosely reticulated.

56. MEESIA. *Peristome* and *calyptra* as in AMBLYODON; *leaves* of close firm texture, strongly nerved.

***** *Capsule striated.*

38. ZYGODON. *Capsule* clavato-pyriform; *calyptra* small, dimidiate; *outer teeth* 16, in pairs, reflexed when dry; *inner peristome* of 8 cilia.

48. AULACOMNION. *Capsule* oval-oblong, unequal, suberect; *outer teeth* 16, equidistant, lanceolate; *inner peristome* as in BRYUM.

62. BARTRAMIA. *Capsule* globose, inclined; *peristome* as in BRYUM; *leaves* papillose, reticulated.

****** *Capsule smooth, mostly pyriform.*

55. PALUDELLA. *Capsule* oval-oblong, unequal, inclined; *outer peristome* of 16 teeth; *inner peristome* a membrane divided halfway into 16 segments without intermediate cilia; *leaves* squarrose.

47. TIMMIA. *Capsule* obovate, cernuous; *outer peristome* of 16 teeth; *inner* a membrane divided halfway into 64 filiform processes variously united at the summits; *leaves* sheathing, rigid, lanceolate; *barren flowers* axillary, gemmiform.

49. ORTHODONTIUM. *Capsule* clavato-pyriform, inclined; *outer teeth* 16, inflexed when dry; *inner peristome* deeply divided into 16 narrow carinate processes; *leaves* very narrow, tender, not sheathing; *barren flowers* axillary, gemmiform, aggregate.

50. LEPTOBRYUM. *Capsule* and *peristome* as in BRYUM; *stems* of annual growth, without innovations; *leaves* almost setaceous.

51. BRYUM. *Capsule* pyriform, cernuous or inclined; *outer teeth* 16; *inner peristome* a membrane divided halfway into 16 carinate segments, with or without intermediate cilia; *stems* perennial, producing innovations below the terminal flower; *barren flower* gemmiform or naked.

52. MNIUM. *Capsule* oblong, pendulous; *peristome* as in BRYUM; *stems* with innovations from the lower part; *leaves* large; *barren flower* discoid.

53. CINCLIDIUM. *Capsule, leaves,* and *stem,* as in MNIUM; *outer teeth* 16, short; *inner peristome* cupuliform.

SECT. I. *b.* CLADOCARPI. *Fructification terminal on very short lateral branches; but not truly pleurocarpous.*

DIVISION I. *Peristome none.*

2. SPHAGNUM. *Capsule* globose, sessile on a stalked vaginula.

DIVISION II. *Peristome single.*

54. MIELICHHOFERIA. *Teeth* 16, simple; *capsule* pyriform, inclined.

72. FISSIDENS (partly). *Teeth* 16, bifid; *leaves* vertically distichous.

28. CINCLIDOTUS (occasionally). *Teeth* 32, contorted, anastomosing at the base; *capsule* immersed, or shortly pedicellate.

SECT. II. PLEUROCARPI. *Fructification truly lateral.*

DIVISION I. *Calyptra dimidiate.*

SUBDIVISION I. *Peristome none.*

73. ANŒCTANGIUM. *Capsule* oval, erect; *lid* obliquely rostrate; *stems* erect, cæspitose.

* * *

SUBDIVISION II. *Peristome almost single.*

Inner peristome very short and indistinct.

74. LEUCODON. *Capsule* oval, erect, on a short pedicel; *calyptra* large; *outer teeth* 16, bifid or perforated, not hygroscopic; *surculi* erect, simple; *leaves* plicato-striate, nerveless.

78. PTEROGONIUM. *Capsule* oblong, erect, on a long fruitstalk; *calyptra* small; *outer teeth* 16, simple, hygroscopic; *surculi* dendroid, with fasciculate curved branches; *leaves* not striated.

76. LEPTODON. *Capsule* oval, on a very short fruitstalk; *calyptra* and *vaginula* hairy; *surculi* pinnate; *branches* curled when dry; *leaves* very obtuse.

* * *

SUBDIVISION III. *Peristome double.*

† *Inner peristome composed of* 16 *cilia.*

75. ANTITRICHIA. *Capsule* on a short curved fruitstalk; *calyptra* rather large, smooth; *inner peristome* of 16 filiform processes; *surculi* procumbent, pinnate.

77. ANOMODON. *Capsule* oval-oblong, erect, on a long fruitstalk; *lid* obliquely rostrate; *calyptra* small; *peristome* as in the last; *stems* erect, with erect branches, cæspitose; *leaves* of close texture, acuminate, nerved.

81. CYLINDROTHECIUM. *Capsule* oblong, erect; *outer teeth* 16, inserted below the mouth of the capsule; *inner peristome* as in NECKERA; *lid* shortly rostellate; *stem* procumbent, pinnate; *leaves* ovate, concave, faintly 2-nerved at the base; *areolæ* very narrow.

85. NECKERA. *Capsule* oval-oblong, immersed or pedicellate; *lid* obliquely rostrate; *outer teeth* 16; *inner peristome* of 16 narrow carinate processes; *stem* pinnate; *leaves* complanate, undulated.

†† *Inner peristome, a membrane divided halfway into 16 carinate segments, with or without intermediate cilia.*

* Capsule symmetrical, erect, or suberect.

84. Omalia. *Leaves* complanate, smooth; nearly allied to Neckera.

82. Leskia. *Leaves* spreading every way; *inner peristome* usually without intermediate cilia; allied to Hypnum.

80. Climacium. *Capsule* oblong, erect; *lid* adhering to the persistent columella; *segments of the inner peristome* scalariform, without intermediate cilia; *stem* dendroid, erect.

79. Isothecium. *Capsule* oval, suberect, symmetrical; *lid* not adhering to the columella; *stem* dendroid, drooping; *branches* fasciculate or pinnate.

** Capsule unequal, cernuous.

83. Hypnum. *Inner peristome* with intermediate cilia.

††† *Inner peristome a reticulated cone.*

90. Dichelyma. *Peristome* as in Fontinalis; *capsule* scarcely exserted; *calyptra* dimidiate, long, twisted; *leaves* nerved.

Division II. *Calyptra mitriform.*

86. Hookeria. *Capsule* cernuous; *peristome* as in Leskia; *calyptra* not fringed at the base; *leaves* complanate, loosely reticulated.

87. Daltonia. *Capsule* erect, on a long fruitstalk; *inner peristome* divided almost to the base into 16 narrow carinate processes; *calyptra* fringed at the base; *leaves* spreading every way; *areolæ* small.

88. Cryphæa. *Capsule* immersed, subsessile; *calpytra*, conical, small, not fringed at the base; *peristome* as in Neckera.

89. Fontinalis. *Capsule* immersed, sessile; *calyptra* conical; *outer teeth* 16, united in pairs at the apex, twisting when dry; *inner peristome* a reticulated cone.

ORDER I. ANDREÆACEÆ. Schistocarpi *Bridel.*

1. ANDREÆA *Ehrhart.*

Acrocarpous mosses, with the habit of *Jungermannia*, four-valved capsules, and purplish-brown lurid leaves.

Stems erect, somewhat rigid, or occasionally flaccid, cæspitose, sparingly branched, rooting only at the base, brittle when dry; *branches* fastigiate; innovations from below the floral apex.

Leaves imbricated in eight rows, spreading, concave, oval, ovate, ovate-lanceolate, or subulate, entire, nerveless, or nerved, occasionally secund, areolæ dot-like, texture firm, colour purplish-brown.

Inflorescence monoicous or dioicous; *flowers* terminal, gemmiform; *antheridia* oval-oblong, or oval, few, with or without paraphyses; *archegonia* few, without paraphyses; *perichætium* usually large and convolute.

Capsule oval, erect; sessile on the elongated receptacle, as in *Sphagnum*, laterally 4-cleft or 4-valved, the segments or valves united at the summit by means of the persistent lid, gaping when dry. *Calyptra* mitræform, thin and fugacious, closely covering the capsule, at first continuous with the vaginula at the summit of the stalked receptacle. *Sporangium* and *columella* as in *Phascum*. *Spores* rather small, at first clustered four together.

Perennial, growing on alpine or subalpine rocks.

This genus, named in honour of *André*, an Hanoverian naturalist, connects the tribe of mosses with the *Jungermanniæ*. In the elongated and exserted receptacle of the fruit it is allied to *Sphagnum*. The calyptra, as in that genus, is severed from the vaginula by the distension of the ripening capsule, and not by an elongation of the fruitstalk as in all other mosses, except *Archidium*.

Acroschisma of Hook. fil. & Wils. (in *Musc. Antarct.*) has the capsule cloven only in the upper half.

a. Leaves nerveless.

/ ✓ 1. *Andreæa alpina* Dill. Linn. (*alpine Andræa*); stem with elongated fastigiate branches; leaves imbricated, spreading, obovato-acuminate, concave, contracted below the middle, appressed when dry; perichætial leaves large, elliptic, acute, convolute. (TAB. VIII.)

Andreæa alpina *Hedw.* Sp. Musc. t. 7. f. *p.* (the magnified acute leaf only). *Turner. Smith. Eng. Bot.* t. 1278.

Hooker in Linn. Trans. v. 10. t. 31. f. 1. *Schwaegr. Greville and Arnott* in Wern. Trans. v. 4. t. 7. f. 1—4. (for the fruit). *Bridel*, partly? *Hook. and Taylor.*
A. rupestris var. gigantea *Swartz* in Herb. Turner.
Jungermannia alpina *Linn. Dill.* Musc. t. 73. f. 39.

var. β. stems slender; leaves lax, pale. (var. γ. of Hooker and Taylor.)

Hab. Alpine rocks. var. β. on Ben Nevis, 1808, *Hooker and Borrer.* Fr. May, June.

Stems 1—3 inches in length, densely cæspitose; branches fastigiate, an inch long, or more. Leaves imbricated, spreading, appressed when dry, larger on the fertile shoots than on the barren branches, reddish or purplish brown, sometimes blackish, glossy when dry, obovate-acuminate, and somewhat panduriform, areolæ dot-like, small. Perichætial leaves large, sheathing, convolute. Stalked receptacle (or *pseudopodium* of Bridel) somewhat longer than the perichætium, bearing the abortive archegonia near the top. Capsule sessile, or with its short pedicel wholly included in the vaginula at the top of the receptacle, 4-valved, the valves widely gaping when dry. Inflorescence apparently dioicous; antheridia 7 or 8, mixed with long reddish filiform paraphyses, which are of firmer texture than usual in other mosses.

This species has been much confounded, by *Weber and Mohr* and others, with the next species. The figures and description of Dillenius doubtless belong to this moss.

✓ 2. *Andreæa rupestris* Linn. Hedw. (*rock Andræa*); stems short, with fastigiate branches; leaves imbricated, spreading from a sheathing base, subsecund, ovate or ovate-subulate, rather obtuse, papillose, nerveless; perichætial leaves large, ovate-lanceolate, convolute. (TAB. VIII.)

Andreæa rupestris *Hedw.* Sp. Musc. t. 7. f. 2. (fig. not good). *Schwaegr. Eng. Bot.* t. 1277. *Hooker* in Lin. Trans. v. 10. t. 31. f. 2. *Web. and Mohr*, Bot. Tasch. t. 11. f. 5, 6. *Funk*, Deutsch. Moose, p. 9. n. 6. *Moug. and Nestler*, n. 115. *Bridel. Hook. and Taylor.*
A. alpina *Web. and Mohr*, Bot. Tasch. t. 11. f. 3, 4. *Funk*, Deutsch. Moose, t. 6. n. 1.
Jungermannia rupestris *Linn.* Sp. Pl. 1601.

Hab. On subalpine rocks, frequent. Fr. May, June.

Stems about ¼ inch in height, growing in incoherent tufts, sparingly branched. Leaves erect, and somewhat sheathing below, spreading above, frequently but not constantly secund, appressed when dry, narrowly ovate, somewhat tapering or subulate above, rather obtuse, papillose at the back; areolæ dotted; colour reddish-brown. Perichætial leaves larger, convolute. Capsules similar to the last, but smaller and paler.

This species is known from the preceding by its smaller size, and by its obtuse rufous and papillose not glossy leaves, which are also frequently secund. A variety with narrower and longer leaves was gathered near Newcastle by *Mr. Thornhill and Mr. Robertson.*

Dillenius, as appears from his remark, "in rupibus surculi e fusco-rufescunt," considered this to be a variety of the preceding species. The figure given by *Weber and Mohr*, being magnified to thrice the natural size, has probably tended to mislead.

A. acutifolia Hook. fil. and Wils., a South American species, differs in its larger size and very acute leaves. *A. mutabilis* Hook. fil. and Wils., is an intermediate species, with narrower and more erect leaves than *A. rupestris*. *A. nitida* Hook. fil. and Wils., has ovate-oblong obtuse leaves, reflexed in the margin, and is a very distinct species. *A. subenervis* Hook. fil. and Wils., from the Andes of Quito, &c., is a large and beautiful species, with distant, oval or roundish, flaccid leaves.

b. Leaves nerved.

✓ 3. *Andreæa Rothii* Roth, Web. and Mohr. (*black falcate Andreæa*); stems short, sparingly branched; leaves loosely imbricated, falcato-secund, subulate from an ovate base, with a broad thick nerve continued to the apex; perichætial leaves larger, elliptic-acuminate, convolute. (Tab. VIII.)

Andreæa Rothii *Web. and Mohr.* Bot. Tasch. p. 336. t. 11. f. 7, 8. *Schwaegr.* Suppl. t. 106. (badly coloured, and much too pale). *Hooker* in Lin. Trans. v. 10. t. 31. f. 3. *Eng. Bot.* t. 2162. *Moug. and Nestl.* n. 116. *Funk*, Deutsch. Moose, t. 6. n. 3. *Bridel. Hook. and Tayl.*

A. rupestris *Bridel*, Meth. Musc. *Turner. Wahlenberg. Smith*, Fl. Brit. *Dill.* Musc. t. 73. f. 40.

Hab. On subalpine or alpine rocks, common. Fr. May, June.

Stems scarcely ½ inch in height, often less, incoherently tufted. Leaves falcato-secund, rigid, lurid, almost black, ovate at the base, the subulate prolongation twice as long, the nerve thick and predominant above. Perichætial leaves larger and convolute. Capsules as in the preceding.

Andreæa Grimsulana of Schimper is a variety of this, with less falcate lanceolato-subulate leaves. *A. crassinervia* of Bruch seems to be another variety, with a thicker nerve. *A. falcata* of Bruch and Schimper is a distinct but allied species, with longer and more attenuated leaves and larger hexagonal areolæ. *A. subulata* of Harvey, from the Cape of Good Hope, has longer and more falcate leaves than *A. falcata*, and *A. perichætialis* Hook. fil. and Wils. has still longer leaves slightly falcate, and the perichætium less conspicuous.

4 ✓ 4. *Andreæa nivalis* Hooker (*tall slender Andreæa*); stem elongated, slightly branched; leaves loosely imbricated, subfalcate, secund, lanceolato-subulate, nerved to the apex; perichætial leaves similar to the rest; capsule immersed. (Tab. VIII.)

Andreæa nivalis *Hooker* in Lin. Trans. v. 10. p. 395. t. 31. f. 4. *Eng. Bot.* t. 2334. *Hook. and Tayl. Schwaegr.* Suppl. t. 248. *Bridel.*

Hab. Alpine rocks, about the limit of perpetual snow. Rocks at the highest summit of Ben Nevis, Scotland, at the eastern end. Plentiful on Ben-y-mac-duich, and on other mountains of the Cairn Gorm range. Fr. Summer.

Stems 2 or 3 inches long, cæspitose, slender. Leaves lax and distant, subfalcato-secund, incurved not appressed when dry, narrowly lanceolate, tapering, acute, somewhat carinate, nerve narrower and more defined than in the last, continued to the apex; colour of the foliage pale reddish-brown; texture thinner and less opaque than in the preceding. Perichætial leaves lax, not sheathing nor convolute, narrowly lanceolate, somewhat larger than those of the stem. Capsule not rising above the perichætial leaves, small; the pedicel or receptacle often shorter than the capsule. Inflorescence dioicous; barren-flower buds large, with numerous antheridia.

A very distinct species, in aspect approaching to *Jungermannia juniperina.*

ORDER II. SPHAGNACEÆ.

2. SPHAGNUM *Dillenius.* Bog Moss.

The *Sphagna* differ from all other known mosses in the fasciculate insertion of the branches, in the structure of the leaves, capsule, and antheridia, and in the absence of proper roots.

Perennial, aquatic, or amphibious plants, growing in dense patches, usually of a whitish colour, in some species occasionally reddish or lilac. *Stems* simple, or forked, or sometimes branched and fastigiate, erect, the internal tissue almost woody, coated with one layer or usually with several concentric layers of large membranous cells. *Branches* disposed in fasciculi of 3, 5, or 7, the fascicles spirally inserted in a quinquefarious manner, at first short, subclavate and erecto-patent, subsequently elongated, widely spreading, and recurved, the lower branches of each fascicle attenuated, pendulous, and closely applied to the stem. *Leaves* quinquefarious (disp. $\frac{2}{5}$), those of the stem obliquely inserted, erect, spreading or deflexed, ovate, more or less obtuse; branch-leaves more crowded, concave, roundish, ovate, or lanceolate, nerveless, curiously reticulated, the principal cellules lined (in all but one exotic species) with spiral or annular filaments, perforated (chiefly at the back of the leaf) with minute pores, communicating also with each other by intercellular pores; the network of the leaf constitutes the real parenchymatous tissue, and is formed of narrow elongated cellules without pores, more or less filled with chlorophyll. *Inflorescence* monoicous, or dioicous. *Antheridia* roundish, like those of *Jungermannia,* pedicellate, inserted singly amongst the perigonial leaves (which are usually coloured) at the clavate extremity of short ramuli. *Fertile flower* at first sessile, occupying the place of one of the upper ramuli, in the axis of a fascicle: as the fructification advances, the receptacle elongates, and the perichætial leaves becoming separated from each other, it presents the appearance of a lateral branch; hence the genus is *cladocarpous*, though in the first stage it seems rather to be *pleurocarpous*. *Perichætial leaves* at length much larger than the rest, sheathing and convolute. *Archegonia* about 4 together, without paraphyses. *Capsule* globular, sessile on the turbinate fleshy vaginula, within which the bulb-like pedicel is enclosed; sometimes, though rarely, two capsules occur on the same receptacle. *Peristome* none. *Lid* flattish. *Calyptra* entirely surrounding the ripe capsule, ruptured near the middle, the lower part persistent and continuous with the apex of the vaginula. *Columella* abbreviated, not rising so high as the mouth of the capsule. *Spores* small, at first clustered, four together.

This singular genus was considered by Bridel and the authors of the *Bryologia Germanica*, to be destitute of a vaginula, and was accordingly referred to a separate order. It agrees in this respect with *Andreæa ;* and in the structure of the antheridia it presents a strong analogy to the *Hepaticæ*, between which and the true mosses, *Sphagnum* and *Andreæa* may be regarded as intermediate links. The name *Sphagnum* was first used by Pliny for some kind of moss that grew upon trees.

Mr. Valentine has given a very accurate account of the structure in *Musci Nottinghamienses*. The true cellular parenchymatous tissue is correctly stated to be derived from the elongated interior tubes of the stem. The function of the larger air-cells is not yet fully understood ; but they may serve instead of roots, which are entirely absent from the full-grown plants. Designed, as the *Sphagna* are, to fill up water pools in bogs, which they do in a very short space of time, roots are unnecessary, and when at length, from increase of bulk, they emerge from the watery element, an admirable provision for the continued supply of moisture is secured by the densely crowded stems having their pendulous ramuli so applied to their surfaces as to ensure the capillary attraction upwards of the moisture from below. The debris of the plants, the growth of former years, is perfectly indestructible by moisture. In some favourable sections of peat mosses, exposed by the diggers for peat, strata of bog-moss, several feet or even yards in thickness, may be seen, very little changed in appearance or colour ; they mark the site of formerly existing pools of water, and the peat there found is rejected, as being too light and spongy for the purpose of fuel.

In this family the leaves and the fascicles of branches are disposed around the stem in spirals, so that for every complete spiral formed by five fascicles of branches, there are eight spirals formed by twenty leaves, four leaves being inserted between each pair of fascicles. The insertion of the fascicles, like that of the antheridia, is not in the axils of the leaves, but immediately at the side of the leaf, presenting some analogy to *Fontinalis*.

After close and extensive observation of the species in their places of growth, it is believed that they do not owe their characters to any local or adventitious influences. It is not uncommon to find three or more species growing intermixed; though some are confined to peat mosses in parts which have never been disturbed by the spade. The definitions of the species in works already published are unsatisfactory; little reliance can be placed on the length of the pedicel of the fruit, or on the number of the branches in a fascicle. In the determination of the species, we have availed ourselves of the differences of form and structure presented by the leaves; those of the stem and of the perichætium being especially important in one or two species. The structure and form of the utricles, constituting the external tissue of the branches, are also of great service in a few other cases. In general, the species are easily recognised by their habit. Of the nine species described in this work two are undescribed in Bridel's *Bryologia Universa.* It is remarkable that in the same locality, and in precisely similar circumstances, six of the species are constantly pale, without any tinge of red, while three species, *S. cymbifolium*, *acutifolium*, and *rubellum*, are frequently of a reddish hue.

Bridel describes the lid "cum crepitu desiliens;" and this is confirmed by Mr. Thomas Lyle of Airth, and subsequently by our own observation. The capsule in drying contracts strongly, and, by the pressure, the lid is at length driven off with considerable force, accompanied with an audibly explosive sound, to the distance of seven inches or more; the spores also are ejected at the same time, either by the explosion of the compressed air, or by their own elasticity.

The structure of the contents of the anther is very curious, and was first well observed by M. Unger. At the period of inflorescence, (from October to March,) the anther bursts at the apex. It is filled with minute bodies (*spermatozoides* of M. Schimper) consisting at first of hemispherical cellules, whose diameter is about $\frac{1}{3500}$ of an inch. These, when the anther is ripe, present to view a spirally coiled fibre of one turn and a half, attached to one end of an opaque-greenish corpuscle, shaped like a sausage, with a constriction in the middle, changed to blue on the application of tincture of iodine. These corpuscles with their spiral fibres, exhibit in water a great variety of movements. Their progressive motion is usually effected by gyrations in the direction of the axis of the spiral, the spiral acting as a screw to draw the corpuscle through the fluid. These movements continue for some minutes, and with different degrees of velocity, sometimes slow, at other times very rapid, and seem to be the effect of a small jet from an orifice in the corpuscle, the jet being probably caused by the action of *endosmose.* We cannot agree with those authors who consider these corpuscles to partake of the nature of animalcules. When dry, the spiral fibres are always more or less uncoiled, and are often nearly straight, detaching themselves very often from the corpuscle. The observations of M. Schimper, in his excellent and most elaborate *Recherches Anatomiques et Morphologiques sur les Mousses,* appear to have been made from immature examples; hence the movements and even the structure of the spermatozoids have not been fully understood, and the illustrative figures given at Tab. 6. are inaccurate representions of the fully developed contents of the anther. The reader will find in Lindley's *Vegetable Kingdom,* some instructive remarks as to the origin of the spiral coil, which appear to us to be well founded, the coil not being included *within* a sac, as represented in some of M. Schimper's figures, but formed at the expense of the sac itself, the apex of which includes the corpuscle, whose length is about $\frac{2}{3}$ of the diameter of the sac, and which is placed in such a position as to form part of the spiral coil. Most of the species have the antheridia in a fit state for examination at the beginning of March.

SECT. I. *Leaves obtuse, roundish, or elliptical.* OBTUSIFOLIA.

a. Utricles of the branches lined with spiral fibres.

1. *Sphagnum cymbifolium* Dill. Ehrh. (*blunt-leaved Bog Moss*); stem robust, elongated; branches short, crowded, tumid, obtuse; leaves roundish-ovate, very concave, obtuse, muriculate at the dorsal apex; utricles lined with spiral filaments. (TAB. IV.)

Sphagnum cymbifolium *Ehrhart. Röhling. Schultz. Hedwig,* Fund. Musc. with figures. *Swartz. P. Beauv. Nees and Hornsch.* Bryol. Germ. t. 1. f. 1. *Bridel.*

Sphagnum latifolium *Hedw.* Sp. Musc. *Schwaegr. Wahlenb. Turner. Smith,* Eng. Bot. t. 1405. *Moug. and Nestl.* n. 113. *Funk,* Deutsch. Moose, t. 2. n. 1.

Sphagnum obtusifolium *Hook and Taylor,* partly. *Ehrh. Hoffman.*

Hab. Bogs, turbaries, &c., abundant. Fr. June, July.

Stems 3 inches to a foot long, or more, robust, firm, with short, tumid, usually crowded branches, in fascicles of 3, 4, or 5 together, 2 or 3 of them pendulous and applied to the stems. Stem-leaves subspathulate, obtuse, deflexed; branch-leaves (*fig. b.l.*) very concave, imbricated, roundish-ovate, cucullate at the apex, which is dorsally sprinkled with prominent sharp papillæ (*fig. a.l.*), by which mark the species is easily recognised, in addition to the character residing in the utricles of the branches, which are always marked with numerous spiral lines, winding between the circular lateral pores. Capsules rather large, globose, on an elongated pedicel, its walls studded with cuticular stomata. Spores reddish brown. Inflorescence dioicous.

This is one of the largest of the genus, and has more tumid branches than any other. The foliage is usually pale or whitish, but frequently assumes a red or purplish tint. To observe the spiral striæ of the utricles it is necessary to strip off a few of the leaves from a young branch before placing it in a drop of water under the microscope. This is a constant and unfailing character, not found in any other species. Several varieties are indicated by Bridel in *Bryologia Universa.*

b. Utricles of the branches without spiral fibres.

2. *Sphagnum compactum* Bridel (*compact Bog-Moss*); stems erect, dichotomous, densely cæspitose, fastigiate; branches much crowded, short, erecto-patent; leaves ovato-subulate, obtuse, concave at the apex; utricles without spiral striæ. (TAB. LXI.)

Sphagnum compactum *Bridel,* Mant. Musc. and Bryol. Univ. ii. p. 16. *Schwaegr.* Suppl. t. 3. *Nees and Hornsch.* Bryol. Germ. t. 2. f. 5. *Funk,* Deutsch. Moose, t. 2. n. 3. *Mough and Nestl.* n. 805.

S. latifolium β. minus *Hook and Taylor. Turner,* Musc. Hib. (curious aquatic form with lax foliage and slender elongated flaccid stems).

Hab. Wet moors; seldom if ever in turbaries. Very fine, with fructification, near Arlary, Scotland, *Dr. W. Arnott.* Abundant near Oakmere, Delamere Forest, Cheshire, *W. Wilson.* Fr., July, August.

Stems from 2 to 4 inches long, or more, dichotomously subdivided, very densely and compactly cæspitose; the branches 2—3 together, very short and much crowded, so as to conceal the stem. Branch-leaves yellowish, slightly spreading, ovate-subulate, obtuse, when flattened roundish-ovate, toothed or præmorse at the apex, which is concave, but much less evidently so than in *S. cymbifolium*, and quite smooth at the back. Pores at the back of the leaf numerous, small, not confined to the margin of the reticulations. Stem-leaves small, elliptical, deflexed. Fruit resembling that of the preceding species. Inflorescence apparently dioicous. Antheridia not observed, though often sought for.

A smaller species than the preceding, and easily recognised by the leaves alone, to say nothing of the absence of spiral striæ in the utricles, which are of a different form. The habit of the species is peculiar, and when growing it might be mistaken for a *Jungermannia* resembling *J. Taylori.*

To this species belong the following varieties: —

S. immersum *Bryol. Germ.* t. 2. f. 4.

S. compactum β. rigidum *Bryol. Germ.* t. 2. f. 5* (which appears to be S. ambiguum of *Huebener*) with longer and more erect branches, and more spreading, rigid leaves.

Of *Sphagnum oblongum* Pal. Beauv., Bridel, we know nothing; it seems to be a variety either of this or of the preceding species.

References to Figures of *S. compactum.*

b. Pairs of branches; lower branch of each pair small and pendent. *b.l.* Branch-leaves magnified. *s.l.* Stem-leaves equally magnified. *a.l.* Apex of branch-leaf more magnified.

3. *Sphagnum molluscum* Bruch (*pale dwarf Bog-Moss*); stem dwarfish, slender, weak, with short soft slender branches; leaves loosely imbricated, spreading, roundish-ovate, very concave; utricles prominently recurved at the apex; capsule small, of thin texture, on a long pedicel. (Tab. LX.)

Sphagnum molluscum *Bruch* in *Bridel*, Bryol. Univ. 1. 753. *Moug. and Nestl.* n. 808.

Hab. On peat mosses, in the wet hollows where water lodges in winter, and in bogs, frequently intermixed with other species. Fr. May, June.

The smallest and most delicate of all the species, remarkable for the pale yellowish hue of the foliage. Stems seldom more than 2 inches long, slender, soft, and fragile. Branches short, about 3 together, not crowded, spreading or slightly deflexed, not obviously attenuated. Stem-leaves (*fig. s.l.*) roundish-ovate, widely-spreading. Branch-leaves (*fig. b.l.*) loosely imbricated and rather widely spreading, very concave, roundish-ovate, not tapering, pale yellowish-white, of soft texture. Areolæ rather large, the interposed tissue of parenchymatous cellules thicker and wider than usual. Perichætial leaves ovate-lanceolate, acute, convolute, rather large. Capsule small, bright orange-red, its walls thin; pedicel elongated. Inflorescence dioicous.

S. molluscum is distinguished from all other species by the curiously recurved apex of the utricles on the branches between the leaves (shown much magnified at *fig. u.*), visible without dissection. The delicate habit of the species is also peculiar. *Sphagnum tenellum* of Persoon, supposed by him to be the same as *S. molluscum*, is unknown to us, except by the figure and description in the *Bryologia Germanica*, and seems to be very different from this. The cellules of the leaves of *S. molluscum* want the dorsal pores so usual in this genus, the pores being on the upper side of the leaf.

A singular variety of *S. molluscum*, with densely tufted stems and solitary not fascicled branches, is found near Todmorden by Mr. John Nowell.

4. *Sphagnum rubellum* Wilson (*red dwarf Bog-Moss*); dioicous; stem slender, with short deflexed attenuated branches; leaves elliptical, obtuse, subsecund; capsule subexserted. (Tab. LX.)

Sphagnum rubellum *Wilson*, MS. ott ?
Sphagnum medium *P. Beauv.* MS. in Herb. Arn

Hab. In peat mosses. Plentiful on Risley Moss, near Warrington, in places exposed to a moderate degree of moisture, often intermixed with *S. molluscum.* The fruit rare. Scotland, *Dr. Arnott, and Dr. Greville.* Ireland, *Mr. Templeton, Miss Hutchins* (in Herb. Turner). Fr. June, July.

This species is not much larger than *S. molluscum.* Stems from 2—4 inches long, slender; branches not much crowded, 3 together, slender, deflexed, often curved. Stem-leaves (*fig. s.l.*) roundish-oval, erecto-patent. Branch-leaves (*fig. b.l.*) elliptic-oblong and obtuse when flattened, appearing ovate by the inflexion of the margin in their natural state, imbricated, concave, subsecund; areolæ rather large and pellucid, with large pores, colour mostly a pale vinous red. Perichætial leaves widely ovate, acute, convolute. Capsule on a short pedicel, scarcely exserted, at first sessile and included in the perichætium. (*fig. c.*)

This is readily known from the ordinary state of *S. acutifolium* by its smaller size and neat delicate habit, and is essentially distinguished by the dioicous inflorescence and elliptical obtuse leaves. The fruit is rare; but the perigonia are found in abundance, and are always conspicuous from their deep vinous red colour in the lower branches. The foliage is almost always more or less tinged with red, beautifully contrasting with the pale yellowish hue of *S. molluscum*, which very frequently grows intermixed, bearing fruit freely, while *S. rubellum* produces capsules very sparingly. Some small barren varieties of *S. acutifolium* are at times difficult to be distinguished from *S. rubellum*, but in them the leaves are always tapering in the upper half, not truly elliptical as in this moss.

SECT. II. *Leaves acuminate, ovate, or ovate-lanceolate.* ACUTIFOLIA.

† Leaves erecto-patent.

7, 5. *Sphagnum acutifolium* Ehrh. (*slender Bog-Moss*); stem more or less elongated, with crowded, slender, attenuated branches; stem-leaves ovate, erect; branch-leaves ovate-lanceolate, tapering, subacute, imbricated, erecto-patent; capsule on a longer pedicel. (TAB. IV.)

Sphagnum acutifolium *Ehrhart*, Crypt. Exsicc. n. 72. *Schrader*, Spicil. Fl. Germ. p. 58. *Schwaegr.* Suppl. t. 5. *Nees and Hornsch.* Bryol. Germ. t. 3. f. 8. *Hook. and Taylor* (partly). *Funk*, Deutsch. Moose, t. 3. n. 8.
S. acutifolium var. β. capillifolium, var. γ. robustum, var. δ. subulatum *Bryol. Germ.* t. 3. f. 8.
Sphagnum capillifolium *Hedw.* Sp. Musc. *Swartz. Smith*, Eng. Bot. t. 1406. *Turner. Moug. and Nestl.* n. 11. (partly). *Wahlenberg. Bridel.*
S. intermedium *Hoffm.* Germ. 2. p. 22.
S. palustre *Linn.* Sp. Pl. 1569. *Dill.* Musc. t. 32. f. 2. A. *Hedw.* Fund. Musc. (with a figure).

Hab. In bogs and marshes. Fr. June, July.

Stems shorter and less slender than in the next species, with more crowded branches, 3 or 5 together; branches more spreading, straight. Leaves ovate-lanceolate, tapering to a præmorse narrow point, less acute than in *S. fimbriatum*, and not so much recurved at the apex; the areolæ larger and diaphanous, frequently red or lilac, at other times almost white. Capsule on a longer pedicel than the preceding. Perichætial leaves smaller, acute. Inflorescence monoicous.

This is known from *S. fimbriatum* by the ovate rather acute stem-leaves, more obtuse branch-leaves, and inconspicuous perichætium. The texture of the foliage is more lax and spongy, and the colour is usually very different. Funk's specimen named *S. capillifolium* belongs to *S. cuspidatum*, and his *S. acutifolium* is an unusually slender state of the species, agreeing, however, with the figure in *Bryol. Germ.* The ordinary state of the species as found in Britain is that named *var. γ. robustum*, by Nees and Hornschuch after *Blandow.*

6. *Sphagnum fimbriatum* Wilson (*fringe-leaved Bog-Moss*); stem slender, elongated, with very slender deflexed attenuated branches; stem-leaves obovate, very broad and obtuse, fimbriated; branch-leaves ovate lanceolate, acuminate; perichætial leaves obovate, obtuse, cucullate; capsule on a short pedicel. (TAB. LX.)

Sphagnum fimbriatum *Wilson,* MS. *Hook. fil. and Wils.* in Musci Antarctici, p. 92.

Sphagnum acutifolium (partly), of *Hooker and Taylor. Drummond's* Musc. Americ. No. 4. (perhaps var. ε. tenue *Nees and Hornsch.* Bryol. Germ. t. 3. f. 8 ****).

Hab. In bogs and marshes, not unfrequent, and abundant in fruit. Fr. June, July.

Stems very slender, often a foot long and more, loosely cæspitose, with slender deflexed branches, about 5 together. Stem-leaves (*fig. s.l.*) roundish, widened upwards, very obtuse, fringed at the top and reticulated on the surface. Branch-leaves (*fig. b.l.*) more acute than in the proceeding species, and of closer texture, slightly recurved at the apex, erecto-patent, imbricated, pale glaucous green, or whitish, never tinged with red. Perichætial leaves (*fig. p.l.*) very large and conspicuous, obtuse, cucullate, closely imbricated over the ripening capsule, and torn after its elevation on the short pedicel. Inflorescence monoicous.

The more slender habit of this moss, together with the peculiar cauline leaves and large conspicuous perichætium, distinguish this from *S. acutifolium*, with which it appears to have been frequently confounded. The pallid glaucous hue of the foliage is also another mark of distinction. It is much more common in Lancashire than *S. acutifolium*, and bears capsules in profusion in seasons when other species are almost barren; yet the archegonium is always solitary in this species.

7. *Sphagnum cuspidatum* Dill. Ehrh. (*wavy-leaved Bog-Moss*); stem elongated, rather flaccid; branches distantly fascicled, deflexed, attenuated; younger branches cuspidate; stem-leaves ovate, acute, spreading; branch-leaves lanceolate, tapering, undulated in the margin when dry. (TAB. LXI.)

Sphagnum cuspidatum *Ehrhart,* Crypt. n. 25. (according to Smith). *Smith,* Eng. Bot. t. 2092. *Turner. Nees and Hornsch.* Bryol. Germ. t. 4. f. 9. *Mougeot and Nestl.* n. 405. *Funk,* Deutsch. M. t. 3. n. 7. *Web. and*

Mohr. Bridel. Hooker and Taylor. Dill. Musc. t. 32. f. 2. B.

Sphagnum capillifolium β. cuspidatum *Bridel,* Musc. Rec. *Wahlenb.* Fl. Lap. S. capillifolium *Funk.* Deutsch. Moose, t. 3. n. 9.

var. β. recurvum; leaves shorter, oblong-lanceolate, recurved when dry.

Sphagnum recurvum *Pal. Beauv.* Ætheog. Prodr. p. 88. *Bridel,* Bryol. Univ. 1. 13.

Sphagnum pentastichum *Bridel,* Mant. Musc.

var. γ. plumosum; leaves longer, much attenuated; branches widely spreading or pendulous. (TAB. IV.)

S. cuspidatum β. plumosum *Bryol. Germ.* t. 4. f. 9.* *Bridel.*

var. δ. hypnoides; leaves crowded, falcato-secund.

S. cuspidatum γ. *Bridel,* Bryol. Univ. 1. 752.

Hab. In wet bogs frequent. var. γ. growing in water.

Fr. June, July.

Stems 3 inches to a foot in length, the aquatic variety sometimes, as in Ravelrig Toll, near Edinburgh, seven feet long (*Dr. Greville*), with distant fascicles of branches 4 or 5 together; branches (*fig. b.*) more or less deflexed and widely spreading, attenuated, longer than in most other species. Stem-leaves ovate, spreading; branch-leaves (*fig. b.l.*) lanceolate-acuminate, spreading, rather acute but præmorse at the apex (*fig. a.l.*), moderately concave, the margin cartilaginous, when dry (*fig. d.*), undulated or slightly crisped. Perichætial leaves broadly ovate, acute. Capsule on a short pedicel. Inflorescence dioicous.

The *var. plumosum* has the leaves sometimes an inch in length, those of the pendant branches (which are sometimes again branched) much attenuated, and serrulate at the apex. *var.* δ is not found in Britain.

S. cuspidatum has usually pale whitish foliage (green in the *var. β. recurvum*). The leaves when dry are flattened, not concave, and their undulated margin, when dry, furnishes an unfailing character to distinguish the species from *S. acutifolium.*

2. 8. *Sphagnum contortum* Schultz (*black-stemmed Bog-Moss*); stem rather rigid, blackish, with a single layer of cortical cellules; branches rather crowded, more or less contorted, attenuated; leaves ovate-lanceolate, acute, straight, imbricated, concave, subcoriaceous. (TAB. LX.)

Sphagnum contortum *Schultz,* Suppl. Fl. Starg. p. 64. *Nees and Hornsch.* Bryol. Germ. t. 2. f. 6. *Bridel. Mougeot and Nestler,* n. 807.

var. β. subsecundum; stems more slender; branches shorter; leaves subsecund. (TAB. LX.)

Sphagnum subsecundum *Nees and Hornsch.* l. c. t. 3. f. 7. *Mougeot and Nestler,* n. 806. *Funk,* Deutsch. M. t. 2. n. 5.

var. γ. obesum; stem more robust; branches thicker and longer; leaves larger.

S. obesum *Wilson,* MS.

S. laxifolium *Valentine,* MS.

var. δ. *laricinum;* stem coated with more than one layer of cortical cellules; leaves loosely imbricated, slightly undulated when dry, pores of the leaf very minute.
S. laricinum *Spruce* in lit.

Hab. In bogs, ditches, and near pools, not unfrequent near springs. *var.* β. in wet bogs. *var.* γ. in or near water, at the sides of pools. *var.* δ. bogs. Terrington Carr, Yorkshire, 1847, barren: *Mr. Spruce.* Fr. July.

Stem 3 to 6 inches long or more. Leaves closely imbricated, sometimes secund, ovate-lanceolate, concave, more or less acute, somewhat coriaceous, composed of smaller cellules than usual, the cellules beautifully bordered on each side with a row of small pores at the back of the leaf. Inflorescence dioicous.

The habit of this species is peculiar: it may usually be known at sight by the somewhat fawn-coloured hue and close texture of the foliage. The contorted branches are not always observable, even in the same tuft. *S. contortum* β. *rufescens* of Bryol. Germ. t. 2. f. 6.*, appears to belong to this species. It is closely allied to *S. sedoides* a doubtful and imperfectly known exotic species, of which fine specimens are given in the *Musci Alleghanienses* of Sullivant and Gray, n. 208.

S. contortum δ. *laricinum* may eventually prove to be a distinct species, intermediate between *contortum* and *cuspidatum.* It is known only in a barren state, and has been found in only one spot; and as its distinctive marks are very obscure, we prefer to rank it as a variety of *contortum*, although it differs in the structure of the stem, and the leaves are more loosely imbricated, smaller, narrower, and less coriaceous than in the normal state of the species, and of a greenish hue; the cellules of the leaf are narrower and bordered with exceedingly minute pores; and the margin of the leaf is slightly crisped or wavy when dry, but less evidently so than in *S. cuspidatum.* We have lately observed an intermediate state of *S. contortum*, having the foliage as in *S. laricinum*, and the stem with the usual single layer of cortical cellules.

Reference to Figure of *Sphangnum contortum.*

b.l. Branch leaves. *a.l.* Apex of one of the leaves more highly magnified. *r.* Reticulation of leaf, showing the spiral lining of the cellules and the marginal pores. *r″* The same, still more highly magnified, in *var.* β. *subsecundum.* *b.* A fasciculus of branches detached from the stem, *nat. size.* *s.l.* Stem-leaf, and portion of stem, magnified. *b.l.* Branch-leaves. *s.s.* Portion of a transverse section of stem, highly magnified, showing the single layer of cortical cellules.

†† Leaves squarrose.

9. *Sphagnum squarrosum* Persoon (*spreading-leaved Bog-Moss*); stem elongated, rigid; branches deflexed, attenuated; leaves ovate-acuminate, acute, squarrose, recurved. (Tab. IV.)
Spagnum squarrosum *Nees and Hornsch.* Bryol. Germ. t. 1. f. 3. *Eng. Bot.* t. 1489. *Web. and Mohr. Schwaegr.* Suppl. t. 4. *Moug. and Nestl.* n. 209. *Funk,* Deutsch. Moose, t. 2. n. 4. *Bridel. Hook and Taylor.*

Hab. In bogs, not rare. Fr. June, July.

Stems 6 inches to a foot long, rigid, and robust, often forked or subdivided, with more scattered branches than the first species; branches deflexed or recurved, attenuated, half an inch long or more; 5 in each fascicle, 2 branches pendulous and closely applied to the stem. Leaves much recurved and squarrose, acute, the cellules with large pores at the back of the leaf. Capsules large, on long pedicels. Inflorescence monoicous. Archegonia 4 in each fertile flower.

This species seems to be very constant in its character. The only one liable to be confounded with it is *S. cuspidatum var. recurvum*, which has leaves of a different shape, and undulated in the margin when dry. A state of *S. cymbifolium* has the leaves somewhat squarrose, but they are always obtuse and concullate at the apex, and are very different from this.

ORDER III. BRYACEÆ.

SECTION I. ACROCARPI.

Fruit terminal, sometimes cladocarpous, *i. e.* with fructification at the extremity of a very short lateral branch.

SUBORDER I. PHASCEÆ.

Distinguished by the closed indehiscent *capsule*, which has no proper deciduous lid.

3. ARCHIDIUM *Bridel.* Clay-Moss.

PHASCUM *Hooker and Taylor.*

Capsule globular, sessile, on the short tumid vaginula, without any trace of an operculum. *Columella* fugacious, soon obliterated. *Spores* very large, few, angular. *Calyptra* thin and membranous, irregularly torn in the middle by the swelling of the capsule, as in *Sphagnum.*

Stems very short, erect or procumbent, branched, cæspitose, in favourable circumstances bi-triennial, or perhaps perennial, with innovations (new fertile shoots) from the base of the flower, and long slender barren branches or stolons from the lower part of the stem of the previous year. *Leaves* lanceolate, entire, nerved; perichætial leaves larger than the rest, erect.

Inflorescence monoicous; *barren flower* gemmiform, 2-leaved or naked, in the axils of the perichætial leaves.

The genus *Archidium* is distinguished from *Phascum* by the sessile globular capsule, large spores, and perennial growth. Only one species is found in Europe. Name from *αρχιδιον*, *beginning;* because this genus is the first and the most simple of the series.

14- *Archidium phascoides* Bridel (*large-seeded Clay-Moss*); leaves lanceolate, distant; perichætial leaves ovate-lanceolate, acuminate, toothed near the apex, nerve strong, excurrent. (Tab. V.)

Archidium phascoides *Bridel*, Bryol. Univ. 1. 747. Tab. Suppl. III. *Schwaegr.* Suppl. t. 205. *Bruch and Schimp.* Bryol. Europ. fasc. 1. t. 1. p. 4. and fasc. 43. t. 1.

Phascum alternifolium *Dickson*, Crypt. fasc. 1. 2. t. 1. f. 2. *Smith*, Fl. Brit. Eng. Bot. t. 2107. *Hedwig*, Sp. Musc. *Schwaegr.* Suppl. t. 10. *Hooker and Taylor*, Musc. Brit. ed. 1 & 2. t. 5.

Hab. Moist banks, heaths and fallow ground, in a clayey or chalky soil. Fr. March, April.

Stems of the first year ¼ inch long, simple; in the following year decumbent, branched, elongated, sometimes an inch long. Fertile branches, or innovations, short, crowned with the perichætial leaves; sterile branches very slender, with remote leaves. Stem-leaves disposed in five rows, lower ones smaller, lanceolate, entire, nerve strong, vanishing below the apex; upper leaves larger; perichætial leaves much larger, evidently toothed near the apex, nerve excurrent, forming a subulate point. Vaginula small, roundish. Spores very large, angular from mutual pressure, about 16 in each capsule, greenish. Calyptra very thin, scarcely discernible on the ripe capsule. Antheridia naked in the axils of the perichætial leaves, or rarely with 1 or 2 involucral scales.

Archidium phascoides has been confounded with the true *Phascum alternifolium;* and even in the excellent work of Bruch and Schimper its synonymy is not correctly given. The barren shoots have some resemblance to *Dicranum varium*, but the leaves are shorter, more distant, not reflexed in the margin, and they have a much stronger nerve.

4. PHASCUM *Lin.* Earth-Moss.

Capsule subsessile or shortly pedicellate, ovate, or roundish, indehiscent, or sometimes with traces of a line of dehiscence below the imaginary or persistent lid. *Calyptra* campanulate or cucullate. *Spores* much smaller than in *Archidium*, but larger than in most of the other genera, roughish or muriculate on the surface, roundish. *Columella* soon disappearing in the smaller species.

Plants very small, almost stemless, the larger species caulescent, slightly branched, mostly annual, growing upon newly exposed soil. *Leaves* in eight rows (disp. $\frac{3}{8}$), erect, or spreading, more or less crowded, nerved, rarelynerve less, entire, or serrated, lanceolate, linear-lanceolate, or subspathulate, their cellules rather large, forming oblong or roundish areolæ.

Inflorescence monoicous; *barren flower* either gemmiform at the base of the fertile plant, or axillary, gemmiform or naked, more rarely terminal and discoid; *fertile flower* terminal, gemmiform; *antheridia* and *archegonia* few, with or without filiform paraphyses.

In strict adherence to a natural method of arrangement, this genus should be parcelled out into several suborders; but in a work of this kind it seems desirable not to disturb the existing nomenclature, and we have accordingly disposed the species into sections of the genus, indicating the suborders to which they respectively belong, so far as the affinities can be ascertained. Name from φύσκιον, *vesicula,* in allusion to the bladdery capsules.

SECT. I. *Of short duration and rapid growth. Stem scarcely any; capsule immersed in the leaves; barren flower gemmiform, at the base of the fertile flower or contiguous to it.* EPHEMERUM *Hampe*, &c.

a. Growing from a converva-like thallus; columella fugacious.

15. 1. *Phascum serratum* Schreb. (*serrated Earth-Moss*); stemless; leaves lanceolate, serrated, nerveless, connivent; capsule subsessile, roundish-ovate. (TAB. V.)

Phascum serratum *Schreber*, de Phasco, p. 9. t. 2. *Hedwig*, Sp. Musc. *Smith*, Eng. Bot. t. 460. *Dicks.* Crypt. fasc. 1. t. 1. f. 1. *Turner*, Musc. Hib. *Hook. and Tayl. Weber and Mohr.* Bot. Tasch. p. 71. *Bridel. Nees and Hornsch.* Byrol. Germ. *Bruch and Schimper*, Bryol. Europ. fasc. 1. t. 1. p. 6.

Phascum stoloniferum *Dicks.* fasc. 3. t. 7. f. 2. *Smith*, Fl. Brit. Eng. Bot. t. 2006.

Ephemerum serratum *C. Müller*, Syn. Musc. *Bryol. Eur.* fasc. 42. t. 1.

var. β. angustifolium; leaves narrower, linear-lanceolate, obscurely toothed; capsule smaller.

Hab. Shady banks and fallows, in sandy soil. *Var. β.* at Mere, in Cheshire, with the next species.

Fr. Spring or Autumn.

Plants very minute, gregarious. Leaves 6—9, suberect, often turned to one side, lower ones smaller, all more or less serrated, concave, light green, loosely reticulated. Pedicel very short, scarcely extending beyond the vaginula. Capsule large in proportion to the plant, bright reddish-brown, somewhat pointed. Columella disappearing as the capsule ripens. Calyptra campanulate, sometimes split on one side. Spores about 200, yellowish, rough, and globular, as in most of the species. Infloresence certainly monoicous (dioicous, according to *Bryol. Europ.*); male fl. with fewer leaves; antheridia about 4, without paraphyses.

The conferva-like shoots of this and of the allied species are the first growth of the plant after the germination of the spore, and they disappear in some species after the full development of the fruit. All mosses possess analogous shoots in the first stage of vegetation. *P. stoloniferum* of Dickson is only a state of this species, without the confervoid shoots, growing in a scattered manner, with larger, narrower, and more evidently toothed leaves, and with creeping stolons.

The following closely allied species have not been found in Britain, viz.: *P. tenerum* of Bruch and Schimper; leaves ovate-lanceolate, wider, scarcely toothed at the apex; capsule yellowish; calyptra conical; spores smaller. *P. spinulosum* Br. and Sch., from N. America; *P. cristatum* Hook. and Wils., from Swan River: both of these have the leaves spinulose or crested at the back.

16. 2. *Phascum cohærens* Hedw. (*clustered Earth-Moss*); stemless; leaves ovate-lanceolate, erect, carinate, nerved to the apex; capsule immersed, subsessile. (TAB. XXXVII.)

P. cohærens *Hedw.* Sp. M. t. 1. (figure of leaf incorrect). *Bridel. Bruch and Schimper,* Bryol. Eur. fasc. 1. p. 6. t. 1.
Ephemerum cohærens *C. Müll.* Syn. Musc. *Bryol. Eur.* fasc. 42. t. 1.

Hab. On the ground. Hurst-Pierpoint, Sussex. Sept. 1847.
Mr. Mitten. Fr. Winter.

Distinguished from *P. serratum* by the nerve, which is not unfrequently absent or incomplete, and by the paler colour of the capsule. It is a rather doubtful species. The leaves in American specimens are sometimes ovate-oblong, with recurved points, in which state it may be mistaken for a broad-leaved variety of *P. recurvifolium*. *P. cohærens* varies thus: *var. β. Flotowianum* Funk, leaves narrower, with short nerve; — *var. γ. Lucasianum* Nees and Hornsch., leaves larger, broader; nerve ceasing below the apex.

A section of the leaf, highly magnified, is shown at *fig. s.l. Fig.* 1. shows the natural size; *fig.* 2., the plants magnified; *fig.* 3., leaves, capsules, &c.; *fig.* 4., leaves more highly magnified.

17. 3. *Phascum sessile* Br. and Sch. (*sessile-fruited Earth-Moss*); stem scarcely any; leaves lanceolate-subulate, rigid, denticulate, nerve excurrent; capsule sessile, immersed, small, roundish. (TAB. XXXVII.)

P. sessile *Br. and Schimper,* Bryol. Eur. fasc. 1.
P. crassinervium *Br. and Sch.* Bryol. Eur. fasc. 1. p. 7. t. 2.; perhaps also of *Schwaegr.* Suppl. I. 1. t. 2. *Nees and Hornsch.* Bryol. Germ. t. 4. f. 2, 3. *Bridel.*
Ephemerum sessile *Bryol. Eur.* fasc. 42. t. 2.
var. β. stenophyllum; leaves shorter, linear-lanceolate, subserrulate.
P. stenophyllum *Voit.* in Sturm Deutsch. Fl. Crypt. fasc. 14. *Wilson* in Eng. Bot. Suppl. t. 2829.

Hab. Heaths, &c., in clayey or chalky soil, rare. Henfield Common, Sussex, *Mr. Mitten.* var. β. at Mere, Cheshire,
W. Wilson. Fr. Autumn, Winter.

Plants as small as those of *P. serratum*, and less conspicuous. Leaves narrower, rigid, not much altered when dry, suberect; nerve pale and inconspicuous below, stronger and more defined upwards, extending beyond the laminar portion of the leaf; cellules smaller than in *P. serratum.* Capsule sessile, small, brown, roundish, with a small blunt point. Calyptra mitriform. Spores as in *P. serratum.* Inflorescence monoicous; barren fl. gemmiform, at the base of the fertile flower.

The American *P. crassinervium* is very nearly allied to this, but has the capsule shortly pedicellate. Both are distinct from *P. crassinervium* of Greville (Scot. Crypt. Fl.), which, after much inquiry and doubt, we find to be really the same as *P. pachycarpon* of Schwaegrichen, and of Nees and Hornschuch, and identical with *P. recurvifolium* of Dickson, having the nerve stronger and much more evident than in the species now under consideration.

A section of the leaf, magnified, is shown at *fig. s.l.*

18, 4. *Phascum recurvifolium* Dickson (*strap-leaved Earth-Moss*); stem scarcely any; leaves lingulate or linear-lanceolate, recurved or erect, denticulate, nerve strong and excurrent; capsule ovate, subsessile, immersed. (Tab. XXXVII.)

Phascum recurvifolium *Dickson*, Crypt. fasc. 4. p. 1. t. 10. f. 2. (fig. bad). *Nees and Hornsch.* Bryol. Germ. 1. p. 42. t. 5. f. 4. (fig. bad). *Bridel,* Bryol. Univ. 1. p. 31.

Phascum pachycarpon *Schwaegr.* Suppl. t. 2. (fig. bad). *Bruch and Schimper,* Bryol. Europ. fasc. 1. t. 2. p. 8.

Phascum crassinervium *Greville,* Scot. Crypt. Fl. t. 353. *Hooker,* Brit. Fl. vol. 5. p. 3. *Wilson* in Eng. Bot. Suppl. t. 2932.

Ephemerum pachycarpum *Hampe. C. Müll.* Syn. Musc. *Bryol. Eur.* fasc. 42. t. 2.

Hab. Heaths near Croydon, *Mr. Dickson.* In fallows in limestone or chalky soil. Bedford purlieus, near Wansford, Northamptonshire, *Rev. M. J. Berkeley.* County of Durham, *Mr. Thornhill.* Sussex, *Mr. Mitten.*

Fr. Autumn, Winter.

About as large as the preceding species. Leaves dark green, usually recurved, sometimes erect and straight, lower ones smaller, ovate-lanceolate, upper ones mostly oblong or lingulate, of equal breadth throughout, rarely (as described by Bruch and Schimper) linear-lanceolate, slightly concave, margin somewhat undulated, denticulate near the summit; nerve strong and well defined, usually excurrent; cellules as in the last. Vaginula oval. Calyptra dimidiate. Capsule of firm texture, its walls thick. Spores roundish, slightly granulated on the surface. Barren flowers gemmiform.

An authentic specimen from Mr. Dickson (agreeing well with his description, though not with the figure) in Mr. Turner's Herbarum, enables us to determine this species; and an authentic example of *P. pachycarpon*, from Dr. Schwaegrichen, supplies the means of identifying that moss, the figures and descriptions of which in Schwaegr. Suppl. and in Bryol. Germ. are inaccurate. *P. recurvifolium* is very distinct from *P. patens*, with which it seems to have been confounded, in the form of the leaf, and in the strong excurrent nerve, much more conspicuous than in *P. sessile*, or even in the American *P. crassinervium* Schwaegr., which has narrower tapering leaves.

b. Plants, when mature, without confervoid shoots, columella distinct.

19. 5. *Phascum muticum* Schreb. (*common dwarf Earth-Moss*); stem scarcely any; leaves widely ovate-acuminate, very concave, nerved, connivent; capsule round, erect, subsessile, immersed. (TAB. V.)

P. muticum *Schreb.* de Phasc. p. 8. t. 1. f. 11, 12. *Hedw.* Sp. Musc. p. 23. *Web. and Mohr.* Tasch. p. 69. *Turner,* Musc. Hib. *Smith,* Fl. Brit. Eng. Bot. t. 2027. *Musc. Brit.* p. 8. t. 5. *Nees and Hornsch.* Bryol. Germ. 1. p. 46. t. 5. f. 6. *Bridel,* Bryol. Univ. 1. 22. *Bruch and Schimp.* Bryol. Europ. fasc. 1. p. 8. t. 2.
P. acaulon *β. Lin. Dill.* Musc. t. 32. f. 12.
Acaulon muticum *C. Müller,* Syn. Musc. *Bryol. Europ.* fasc. 42. t. 1.

var β. minus, leaves entire.

Hab. Moist banks and fallows, common. *β.* near the sea, Torquay, Devon. Fr. Autumn, Spring.

Stem almost wanting. Leaves very broad, ovate or roundish-elliptical, concave (not carinate as in the next), all clustered into a bulb-like mass; the two innermost (perichætial) leaves larger than the rest, erect and convolute, acuminate, minutely toothed above; nerve ceasing below the apex, rarely excurrent. Capsule reddish, its texture thick, on a short thick pedicel, erect. Columella distinct. Calyptra very small, erect, campanulate, covering only the apex of the capsule. Spores smaller than in the preceding, smooth, round. Barren flower gemmiform, at the base of the fertile flower. Antheridia without paraphyses.

The var. *β.* is supposed by Bruch and Schimper to be *P. globosum* Schleicher.

20. 6. *Phascum triquetrum* Spruce (*triangular dwarf Earth-Moss*); stem scarcely any; leaves in three rows, connivent, obovato-navicular, sharply keeled, margins reflexed, apex recurved, nerve excurrent; capsule spherical, horizontal, on a long slender curved pedicel, immersed. (TAB. XXXVII.)

P. triquetrum *Spruce,* in Eng. Bot. Suppl. t. 2901.
P. carninatum *Spruce,* MSS., not of *Swartz.*
P. muticum *Mougeot and Nestler,* Stirp. Crypt. Vogeso-Rhen. n. 802. *Drummond,* Musc. Americani, n. 8, (partly). *Müller,* in Univ. Itin. from Sardinia.
Acaulon triquetrum *Bryol Eur.* fasc. 42. t. 1.

Hab. Cliffs between Rottingdean and Newhaven, Sussex, April, 1844, *W. Borrer, Esq.* In various parts of the Sussex Coast, *Mr. Mitten.* Fr. March.

About the size of the last, resembling little triangular bulbs (as shown, magnified, in *fig.* 2, 3, 4.), at first green, subsequently reddish-brown. Leaves about 9, three-ranked, closely imbricated and connivent, the three lowest minute, ovate, nerveless (occasionally cloven, *Spruce*), the three uppermost or perichætial leaves broadly obovate, apiculate, sharply keeled, boat-shaped (*fig. p.l.*) or cucullate, very concave near the apex, closely embracing the capsule, margins reflexed above, denticulate, the point recurved and diaphanous. Vaginula small, ovate. Pedicel very slender, suddenly bent at a right angle near its junction with the capsule (*fig. c.*). Spores rather large. Calyptra small, subdimidiate, covering a very small portion of the capsule, often adhering to the vaginula by one side. Barren flower gemmiform at the base of the fertile flower.

P. muticum is easily distinguished from this species by the perichætial leaves, only 2 in number, erect, strongly convolute, not keeled, the margin plane, cellules smaller, pedicel much shorter and thicker.

P. triquetrum differs essentially from *P. Flörkeanum* and its allies in the spherical capsule, and in the broad, concave, cucullate leaves.

SECT. II. *Barren fl. axillary, antheridia naked. Allied to* Pottia.
PHASCUM *Bryol. Eur.* (partly).

21, 7. *Phascum Floerkeanum* Web. and Mohr. (*Floerke's Dwarf Earth-Moss*); stem scarcely any; leaves crowded, erecto-patent, ovate-acuminate, margins reflexed, nerve excurrent; capsule roundish-ovate, with a very short pedicel, rostellate, immersed. (TAB. XXXVII.)

P. Floerkeanum *Web. and Mohr.* Bot. Tasch. p. 70. *Schwaegr.* Suppl. t. 3. *Nees and Hornsch.* Bryol. Germ. t. 5. f. 10. *Bridel. Br. and Schimp.* Bryol. Eur. fasc. 1. p. 8. t. 3. *Wilson,* in Eng. Bot. Suppl. t. 2887.

Acaulon Floerkeanum *C. Müller,* Syn. Musc. *Bryol. Eur.* fasc. 42. t. 2.

var. β. badium; leaves longer, narrower, capsule smaller, ovate.

P. badium *Nees and Hornsch.* l. c. t. 5. f. 11.

Hab. Fields, &c., in clayey or chalky soil. Coast of Durham, 1840, *Mr. R. Bowman.* Near York, with the *var. β., Mr. Spruce.* Sussex, *Mr. Mitten.* Fr. Sept., Nov.

Plants very minute, about $\frac{1}{20}$ in. in height, sometimes more, growing in scattered patches, colour brownish and scarcely different from that of the soil on which it grows. Leaves few, 13—19, lower ones very small and nerveless, upper ones larger, with an excurrent nerve, concave, slightly recurved at the point, margin reflexed; areolæ small, rhomboid. Capsule reddish-brown, entirely covered by the leaves, with a thick blunt beak or point one-third of its own length, its pedicel thick and very short. Spores numerous, small, pale. Calyptra subconical, rarely cloven on one side. Inflorescence certainly monoicous (dioicous, *Bryol. Europ.*); *antheridia naked, axillary,* without paraphyses, solitary or in pairs.

In size and general aspect this species approaches to *P. triquetrum*, but the leaves are very different in shape, not hood-like and carinate as in that species. A small state of *P. cuspidatum* sometimes occurs, but the leaves are oblong and connivent.

We cannot confirm the latest account of the inflorescence given in

Bryol. Eur., and therefore we retain this species in Section 2. Its affinity, however, to those of the previous section is very close.

22. 8. *Phascum rectum* Smith (*straight-necked Earth-Moss*); stem very short; leaves crowded, erecto-patent, elliptic-lanceolate, nerve excurrent, margins recurved; capsule exserted, roundish, pointed; pedicel straight, elongated. (Tab. V.)

P. rectum *Smith.* Fl. Brit. 1153. Eng. Bot. t. 330. *Turner*, Musc. Hib. *Withering*, Bot. Arr. ed. 4. p. 771. t. 18. f. 1. *Hooker and Taylor. Br. and Schimper*, Bryol. Eur. fasc. 1. p. 11. t. 5. and fasc. 43. t. 2.

Hab. Banks and fields, in England, Wales, and Ireland, more frequent near the sea-coast; rare in Scotland. Fr. Winter.

This has the habit of *Anacalypta Starkeana*, with which it often grows intermixed. It is known by its shorter and roundish capsule. Leaves often reddish. Capsule bright chestnut-colour, with traces of a dehiscent lid, and even of an annulus, when carefully dissected under the microscope. Calyptra roughish with minute papillæ, yellowish brown, dimidiate. Spores muriculate, pale.

23. 9. *Phascum curvicollum* Hedw. (*swan-necked Earth-Moss*); stem very short; leaves erecto-patent, lanceolate-acuminate, nerve much excurrent; capsule roundish, pointed, cernuous, exserted; pedicel curved, elongated. (Tab. V.)

P. curvicollum *Hedwig*, Sp. Musc. p. 21. Stirp. Crypt. t. 11. *Weber and Mohr.* Bot. Tasch. 65. t. 6. *Smith*, Eng. Bot. t. 905. (not t. 330.) *Hooker and Taylor. Nees and Hornsch.* l. c. t. 5. 12. *Bridel. Br. and Schimp.* Bryol. Eur. fasc. 1. p. 11. t. 4. and fasc. 43. t. 2.

Hab. Moist banks and fields. Kent, *Mr. E. Jenner.* Sussex, *Mr. Mitten.* Near Newcastle-upon-Tyne, *Mr. Thornhill.*

Plants minute, gregarious, about $\frac{1}{10}$ in. long, reddish. Leaves suberect, slightly recurved, twice as long as in the last; upper ones narrowly lanceolate, tapering, the excurrent nerve forming a long bristly point; all of them entire, margin reflexed. Capsule with a shorter and blunter point than in the last, and more rounded at the base, the texture very thin and fragile, almost pellucid, without any trace of a lid. Calyptra dimidiate, smooth, and membranous, covering half the capsule.

The curved pedicel of the capsule, and the longer narrow tapering leaves distingush this from the preceding species.

Sect. III. *Barren fl. gemmiform, axillary. Allied to* Anacalypta.

24. 10. *Phascum cuspidatum* Schreb. (*pointed Earth-Moss*); stems simple or branched; leaves ovate-lanceolate, or lanceolate-cuspidate, erect, carinato-concave, nerve excurrent; capsule roundish, shortly pedicellate, immersed. (Tab. V.)

P. cuspidatum *Schreber*, de Phasc. p. 8. t. 1. f. 2. *Hedwig*, Sp. M. *Hooker and Taylor*. *Weber and Mohr*. *Nees and Hornsch*. l. c. t. 7. f. 18. *Turner*. *Smith*, Fl. Brit. Eng. Bot. t. 2025. *Br. and Sch*. Bryol. Eur. fasc. 1. p. 10. t. 4. and fasc. 43. t. 1.

var. β., leaves longer, lanceolate; capsule smaller.

var. γ. *Schreberianum;* stem elongated, branched, dichotomous; leaves spreading, distant.

P. Schreberianum *Dickson*, fasc. 4. t. 10. *Smith*, Fl. Brit. Eng. Bot. t. 2026.

P. affine *Bryol. Germ*. t. 7. f. 19.

var. δ. *piliferum;* stem simple or branched; capsule immersed; pedicel curved; leaves piliferous.

P. piliferum *Schreber*, l. c. t. 1. f. 7. *Nees and Hornsch*. l. c. t. 6. f. 17.

var. ε. *curvisetum;* capsule laterally exserted; pedicel curved, longer.

P. curvisetum *Dickson*, fasc. 4. t. 10. f. 4. *Smith*, Eng. Bot. t. 2259. *Nees and Hornsch*. l. c. t. 7. f. 18.**

var. ζ. *elatum;* stem elongated, simple or branched; upper leaves lanceolate, cuspidate; capsule subpendulous, laterally exserted on a longer pedicel.

P. elatum *Bridel*, Bryol. Univ. I. 45. *Schwaegr*. Suppl. t. 1. *Nees and Hornsch*. l. c. t. 7.

Hab. Hedges, moist banks, and fields, very common, especially in a sandy soil. Fr. March.

A very variable species. Stems usually tufted, short and simple, or elongated and dichotomous. Leaves light green, erect, connivent, sometimes spreading; lower ones small, ovate-lanceolate; upper ones oblong-lanceolate, carinate, concave, margin reflexed, entire, somewhat papillose on both sides, nerve excurrent. Capsule obscurely rostellate, chestnut colour. Pedicel usually short and erect, seldom quite straight, sometimes longer and much curved, bulbed at the base, within the cavity of the roundish vaginula. Calyptra conico-campanulate, or cucullate, small, yellowish. Barren flowers in the axils of the stem-leaves, the involucral leaf mostly solitary, nerveless, sometimes wanting; antheridia mixed with clavate paraphyses.

This species seems to vary according to the soil and local influences to which it is subjected. The leaves are always somewhat cuspidate or bristle-pointed, but in the *var.* δ. *piliferum*, which generally grows near the sea, they have quite a hoary aspect, from their white filiform points.

P. carniolicum of Web. and Mohr, which has not been found in Britain, is allied to this, but quite distinct, having leaves of firmer texture, yellowish-green, more concave, not carinate nor papillose; margin plane or incurved; nerve thicker, scarcely excurrent; areolæ smaller; capsule rostellate, on a very short straight pedicel; barren fl. 6-leaved. The diagnosis is well given by *Web. and Mohr*. in Bot. Tasch. p. 450.

Of *P. stellatum* Bridel, *Br. Univ*. i. 24. nothing is at present known. It was found near Shrewsbury by Mr. Green, and may be only a variety of *P. cuspidatum*, with spreading leaves.

5. 11. *Phascum bryoides* Dickson (*tall Earth-Moss*); stem simple or branched; lower leaves ovate-acuminate, upper leaves ovate-lanceolate, concave, erect, margin reflexed, nerve excurrent; capsule exserted, elliptical, obliquely pointed. (TAB. V.)

Phascum bryoides *Dicks.* Crypt. fasc. 4. t. 10. f. 3. *Smith,* Eng. Bot. t. 1180. *Schwaegr.* Suppl. t. 2. *Nees and Hornsch.* Bryol. Germ. t. 7. f. 21. *Hooker,* in Lond. Fl. Lond. ed. 2. cum icone. *Mougeot and Nestler,* No. 705. *Bruch. and Schimp.* Bryol. Eur. fasc. 1. p. 11. t. 5. and fasc. 43. t. 2.

Phascum gymnostomoides *Bridel,* Bryol. Univ. 1. p. 48.

P. elongatum *Schultz.*

var. β., leaves piliferous. var. γ. piliferum *Bryol. Germ.*

var. γ. curvisetum; pedicel longer, curved.

var. δ. capsule rounder, pedicel very short. var. β. *Bryol. Germ.*

var. ε. smaller, with piliferous leaves. var. β. minus *Bridel.* Phascum pusillum *Schleicher.*

var. ξ. Thornhillii, leaves spreading, subreflexed, spathulato-lanceolate, margin plane, nerve slightly excurrent; capsule narrowly elliptical, rostrate, pedicel elongated.
Phascum Thornhillii *Wilson,* MSS.

Hab. Banks and fields, rare. Near Newcastle, *Mr. Thornhill.* Near Nottingham, *Mr. Valentine.* Near Buxton, *Dr. J. B. Wood.* Sussex, *Mr. Jenner.* Suffolk, *F. K. Eagle., Esq.* Yorkshire, *Mr. Spruce.* *var. ξ.* in old stubble fields near Newcastle, March 1841, *Mr. Thornhill.* Fr. Spring.

Stem erect or decumbent at the base, 2—3 lin. long. Leaves erect, entire, upper ones larger and longer, almost connivent, margin reflexed, nerve excurrent, forming a bristly point. Pedicel more or less elongated, twisting to the right, as it dries. Capsule tapering at the base, elliptical or ovate, with a small oblique beak, brown. Calyptra dimidiate, covering half the capsule. Barren flowers gemmiform, in the axils of the lower leaves of the fertile stem, sometimes terminal on a short branch, occasionally clustered.

Phascum Thornhillii may be a distinct species, but it has only been observed in two localities, scattered in single specimens, amongst *Pottia truncata* β., which it much resembles in the foliage. It differs from the typical form of *P. bryoides* in the following characters. Leaves nearly twice as long, narrower, subspathulate, lax, and spreading, not at all recurved in the margin, nerve scarcely excurrent. Capsule longer, with a longer beak, the pedicel and vaginula nearly twice as long. Barren flower with fewer leaves, and sometimes the antheridia are naked. Spores smaller, slightly muriculate. We find no trace of a dehiscent lid.

SECT. IV. *Barren flower in the axil of a perichætial leaf, with clavate paraphyses, or sometimes (according to Bruch and Schimper) discoid, terminal, on a short branch at the base of the fertile stem. Allied to* Funaria.

26. 12. *Phascum patens* Hedw. (*spreading Earth-Moss*); stem short; leaves spreading, obovate-lanceolate, serrulate, nerve vanishing below the point; capsule spherical-apiculate, on a very short pedicel. (TAB. V.)

Phascum patens *Hedw.* St. Crypt. i. t. 10. *Turner,* Musc. Hib. *Smith,* Eng. Bot. t. 1279. *Schwaegr. Hook. and Tayl. Nees and Hornsch.* Bryol. Germ. t. 5. *Bridel. Br. and Schimp.* Bryol. Eur. fasc. 1. Monogr. p. 9. t. 3.

Physcomitrella patens *Bryol. Eur.* fasc. 42. t. 2.

var. β., leaves narrower, very tender.

P. megapolitanum *Schultz. Nees and Hornsch.* Bryol. Germ. t. 5.

var. γ., pedicel elongated.

Hab. Clay-fields and banks, and on the dried beds of shallow pools. Fr. Autumn.

Stem 1—3 lines in length. Lower leaves scattered, lanceolate, spreading or reflexed; upper leaves larger, crowded, more or less spreading, often recurved, somewhat spathulate, concave, more or less acuminated, serrulate, loosely reticulated; nerve thin, ceasing below the point. Capsule concealed amongst the leaves, round, somewhat pointed, of thin fragile texture, pale brown, subsessile. Calyptra conico-campanulate. Spores rather large, roughish. Barren flower naked, in the axil of a perichætial leaf; antheridia 6—8, small, rarely accompanied by clavate paraphyses.

Schistidium serratum of Hook. and Wils. (Drummond's Mosses of the Southern United States, n. 2.) may possibly be a state of *Phascum patens*, with a regularly dehiscent lid, the hemispherical capsule of thicker texture, and the antheridia more copiously mixed with clavate paraphyses. It is *Aphanorhegma serrata* of Sullivant (Gray's Manual, Bot. U. S.). Compare also *Gymnostomum niloticum* of Bridel, and *Ephemerum patens* δ. *anomalum* of Hampe (Musc. Blankenberg, n. 83.)

Phascum recurvifolium of Dickson, and of Bryol. Germ., often referred to *P. patens*, is a distinct species.

SECT. V. *Stems increasing in length by innovations; capsule, from this cause, often lateral; leaves narrow, almost setaceous.* PLEURIDIUM *Bryol. Eur.* ASTOMUM *Hamp. C. Mull.*

27. 13. *Phascum nitidum* Hedw. (*delicate Earth-Moss*); leaves suberect, carinate, linear-lanceolate or lanceolate, obscurely toothed near the apex; nerve vanishing; capsule oval, shortly pedicellate. (TAB. V.)

P. nitidum *Hedwig,* St. Cr. i. t. 34. Sp. Musc. *Schwaegr.* Suppl. I. 1. p. 7. *Bridel. Br. and Sch.* Bryol. Europ. fasc. 1. p. 12. t. 6.

P. axillare *Dickson*, fasc. 1. t. 1. f. 3. *Turner*, Musc. Hib. *Smith*, Fl. Brit. Eng. Bot. t. 1036. *Nees and Hornsch.* l. c. t. 6. f. 15. *Weber and Mohr. Hooker and Taylor.*
P. stagninum *Wallr.* Linn. 1840, p. 680.
Pleuridium nitidum *Bryol. Eur.* fasc. 43. t. 1. Astomum nitidum *Hampe. C. Müll.* Syn. Musc.

var. β. strictum; stem very short; leaves narrower, straight, crowded; capsule roundish.

P. strictum *Dickson*, fasc. 4. t. 10. f. 1. *Smith*, Fl. Brit. Eng. Bot. t. 2093. *Mougeot and Nestler*, n. 605.

Hab. Moist banks, and on the dried sediment of shallow pools. Fr. Autumn, Spring.

Stems 1—6 lines long, erect, simple, or branched with innovations immediately below the fertile flower, hence often bearing several capsules, in different stages, at intervals, along the stem, and apparently lateral, though really terminal. Leaves crowded or scattered, sometimes spreading, or reflexed, usually erect, channelled and keeled, gradually tapering from the base, upper leaves the longest, margin plane, nerve rather indistinct, ceasing just below the subdenticulate apex. Capsule elliptical, with a short oblique point, pale brown, of fragile texture, its pale pedicel rather longer than the vaginula. Calyptra dimidiate. Inflorescence monoicous; antheridia naked, in the axils of the perichætial leaves. Differs from *P. subulatum*, its nearest ally, in its more delicate habit, having the upper leaves shorter, more loosely reticulated, not setaceous.

28, 14. *Phascum subulatum* Lin. (*awl-leaved Earth-Moss*); stem-leaves lanceolate, suberect; perichætial leaves lanceolate-subulate, nerve rather broad, ceasing near the apex; capsule immersed, roundish-ovate. (Tab. V.)

Phascum subulatum *Lin.* Sp. Pl. 1570. *Schreber* de Phasco. p. 8. *Hedw.* St. Cr. t. 35. *Turner. Smith*, Fl. Brit. Eng. Bot. t. 2177. *Schwaegr.* Suppl. I. p. 1. *Hooker and Taylor. Nees and Hornsch.* l. c. t. 6. f. 16. *Bryol. Europ.* fasc. 1. p. 15. t. 7. *Dill.* Musc. t. 32. f. 10.
Pleuridium subulatum *Bryol. Europ.* fasc. 43. t. 1.
Astomum subulatum *Hampe. C. Müll.* Syn. Musc.

Hab. Banks and fields, common. Fr. Spring.

Stems tufted, 1—3 lines in length, simple, rarely branched, seldom found with innovations. Leaves narrower and more rigid than in the last, with a wider nerve, not carinate; perichætial leaves longer, almost setaceous, crowded, erect. Capsule pale-brown, oval, on a very short straight pedicel. Calyptra dimidiate. Antheridia naked, in the axils of the perichætial leaves.

P. palustre of Br. and Schimp. is allied to this, having the same inflorescence, but the calyptra is mitriform, many-parted at the base, and the capsule is ovate, widened at the base and larger; the perichætial leaves as in *P. alternifolium.*

29. 15. *Phascum alternifolium* Br. and Schimp. (*long-leaved*

Earth-Moss); stem with or without innovations; stem-leaves lanceolate-acuminate, dilated at the base; perichætial leaves subulato-setaceous from a dilated base, nerve thick and much excurrent; capsule ovate, immersed; barren fl. gemmiform. (Tab. XXXVII.)

Phascum alternifolium *Bryol. Eur.* fasc. 1. tab. 17. p. 15. Excluding all the synonyms, which belong to *Archidium phascoides.*
Pleuridium alternifolium *β.* germanicum *Bridel,* Bryol. Univ. ii. 162.
Pleuridium alternifolium *Bryol. Eur.* fasc. 43. t. 2.
Astomum alternifolium *Hampe. C. Müll.* Syn. Musc.

Hab. Banks and fallow ground; perhaps not rare, but generally mistaken for *P. subulatum.* Near Forfar, *G. Donn,* in Herb. Turn. Near Warrington. Sussex, *Mr. Mitten.* Near Newcastle-upon-Tyne, *Mr. Robertson.* Near Falkirk, *Mr. T. Lyle.* Fr. Spring.

Stems annual, unless continued by the growth of innovations in wet and mild seasons; sometimes, though rarely, an inch long, erect, at length more or less procumbent and branched. Leaves more dilated at the base than in *P. subulatum*, more rigid, the nerve thicker, broader and predominant, especially in the perichætial leaves, which are very long, the upper half consisting of the nerve only, without any accompanying lamina; all the leaves minutely serrulate near the apex. Capsule immersed, obliquely pointed, brown, on a short straight pedicel as in the last. Spores small, very numerous. Calyptra dimidiate. Barren flowers gemmiform.

This is distinguished from *P. subulatum* by the long, strongly nerved perichætial leaves, suddenly dilated at the base, and by the gemmiform barren flowers.

The synonymy of this moss is incorrectly given in *Bryologia Europæa*, the first work in which we find it intelligibly distinguished from *Archidium phascoides*, if we except Bridel's very ambiguous moss above cited. Dickson's *P. alternifolium* certainly belongs to *Archidium phascoides*, and so also does that of *Eng. Bot.* t. 2107. and of Schwaegrichen, *Suppl.* t. 10. The two species, *P. subulatum* and *alternifolium*, appear to have been distinguished much earlier on the Continent than in Britain, though few were aware of any difference between the latter and Dickson's moss, and Bridel appears to have confounded them in his description. Dickson's moss is correctly described by himself as having a sessile capsule; Schwaegrichen therefore errs in saying "theca secundum Dicksonum breviseta."

Sect. VI. *Stems more or less branched, perennial; leaves linear-lanceolate, of firm texture, crisped when dry, strongly nerved; capsule with traces of a dehiscent lid; barren fl. terminal on a branch, gemmiform, sometimes axillary.* Astomum, *Bryol. Eur.*

Closely allied to Hymenostomum *of Brown, and of Bruch and Schimper, and indeed not distinguishable, except by the scarcely persistent lid and shorter* *fruitstalk. In a strictly natural arrangement, the species of this section should not be separated from* Gymnostomum.

30. 16. *Phascum crispum* Hedwig (*curly-leaved Earth-Moss*); stems densely tufted, short, subdivided; branches fastigiate; leaves crowded, lanceolate-subulate, channelled, much crisped when dry, strongly nerved, margin involute; perichætial leaves very long, concave below; capsule roundish, rostellate, immersed, very shortly pedicellate. (TAB. V.)

P. crispum *Hedw.* St. Cr. i. t. 9. Sp. Musc. *Turner,* Musc. Hib. *Smith,* Fl. Brit. Eng. Bot. t. 1680. *Bridel. Nees and Hornsch.* l. c. t. 6. f. 13. *Hooker and Taylor. Bryol. Eur.* fasc. 1. p. 13. t. 6.
Astomum crispum *Bryol. Eur.* fasc. 43. tab. 1.

Hab. Banks and fields, chiefly in calcareous soil. Fr. Spring.

Stems usually much crowded, cæspitose, 2—6 lines in height. Stem-leaves crowded, erect or spreading, sometimes reflexed, acute, margin involute, nerve strong and excurrent; perichætial leaves much longer, wider and concave at the base, linear-lanceolate, erect, or sometimes turned to one side, all of them much crisped and incurved when dry, yellowish-green, of close texture, areolæ opaque, except near the base, where they are larger and diaphanous. Capsule on a very short pedicel, immersed in the perichætial leaves, roundish, pale brown, the beak or persistent lid oblique, shorter than the capsule. Calyptra dimidiate, yellowish. Spores smaller than in most of the allied species, ferruginous-brown, roughish. Barren flowers terminal on the branches of the fertile stem (sometimes in the axils of the upper leaves, according to Bruch and Schimper), gemmiform; antheridia with few or no paraphyses.

In this moss, the lid, though perhaps not spontaneously dehiscent, separates very readily from the fully ripe capsule, yielding to the slightest lateral pressure. The mouth of the capsule, on removing the lid, is exceedingly small, about five times the diameter of the spore.

Specimens, gathered in Northamptonshire by the Rev. M. J. Berkeley, have the capsules occasionally exserted on a longer pedicel; but this character varies on the same individual. In this state it is *P. rostellatum* of Hooker and Taylor, and differs from Bridel's moss, so called, in the much larger perichætial leaves, the stronger nerve, involute margins of the stem-leaves, and in the shape of the capsule.

Weissia aciculata and *W. longifolia* Mitten MSS., found in Sussex, appear to be varieties of this species.

1. 17. *Phascum multicapsulare* Smith (*tall crisp-leaved Earth-Moss*); stems elongated, loosely tufted; leaves distant, widely spreading, crisped when dry, lanceolate, apiculate, margin plane; capsule roundish, immersed, rostellate. (TAB. XXXVII.)

P. multicapsulare *Smith,* Fl. Brit. Eng. Bot. t. 618.
P. sphærocarpon *Abbott,* Fl. Bedf. 230.
Astomum multicapsulare *Bryol. Eur.* fasc. 43. Suppl. t. 3.

var. β. Mittenii; stems rigid, fragile; leaves shorter, rigid, acute, recurved, scarcely crisped when dry; perichætial leaves smaller; capsule on a longer pedicel; spores larger. Astomum Mittenii *Bryol. Eur.* Suppl. fasc. 43. t. 2. Hymenostomum sphæricarpon *Mitten,* in lit.

Hab. In fields, rare; in cart-ruts in Clapham Park Wood, near Clapham Fordend, and in other places near Bedford, March, 1799: *Rev. Dr. C. Abbot.* Wet fields, near Darlington, Yorkshire, *Mr. Backhouse.* Appleton, Cheshire, *W. Wilson.* var. *β.* at Hurst Pierpoint, Sussex, on wet clay banks by a roadside, March, 1846; rare: *Mr. Mitten.* Fr. March.

Stems ½ inch long or more, sparingly branched. Leaves distant, dull green, shorter and broader than in the preceding species, rather obtuse, apiculate, the margin plane, very minutely crenulate, nerve excurrent, thinner and less defined, areolæ larger and less opaque; perichætial leaves twice or thrice as long as the rest, erect and incurved, all of them less crisped when dry than in the preceding; hence the stems, in the dry specimens, are remarkably slender. Capsules almost sessile, roundish, sometimes 2 together on the same receptacle, rostellate, the beak or persistent lid about half as long as the capsule, oblique. Spores and calyptra as in *P. crispum.* Barren flowers terminal at the extremity of a branch, often clustered, gemmiform; antheridia mixed with paraphyses. In *var. β.* ♂ fl. usually lateral, as shown in *Bryol. Eur.*, but sometimes terminal and clustered, as in *var. α.*

This is distinguished from the preceding by the wider, plane, apiculate leaves, less crisped when dry. The specimens sent to Weber and Mohr (*Bot. Tasch.* p. 477.), from Mr. Turner's Herbarium, belong to *P. patens*, with serrulate leaves; that species, as also *P. cuspidatum*, having been sent by Dr. Abbot to Mr. Turner, named by mistake *P. multicapsulare.* The description in *Fl. Brit.* "foliis nunquam exsiccatione crispis," is inaccurate: in *Eng. Botany*, the leaves are correctly stated to have "some tendency to curl, though not in the same manner as *P. crispum*, and the points often incurved or contorted when dry." Our specimens agree with an original one given by Mr. Sowerby to Mr. Borrer.

Our *var. β Mittenii* may perhaps be a distinct species, and is so regarded by the authors of the *Bryologia Europæa;* but we find the position of the barren flower too variable in this and the allied species to be relied on as an essential character; and there is also good reason to believe that, in the same place where this variety was gathered in 1846, the ordinary form of *P. multicapsulare* only was found in the following year; hence it would appear that *P. Mittenii* is only an accidental variety.

P. polycarpon of Br. and Schimper is said to differ from our moss in the large, ovate-lanceolate, entire leaves, not crisped when dry, and in the curved elongated pedicel. It may possibly be a tall state of *P. carniolicum.*

32. 18. *Phascum rostellatum* Bridel (*beaked Earth-Moss*); stems short, tufted, simple or branched; leaves linear-lanceolate, spreading, crisped when dry, margin plane; capsule ovate or elliptical, rostellate, scarcely exserted. (Tab. XXXVIII.)

P. rostellatum *Bridel,* Bryol. Univ. i. 46. *Nees and*

Hornsch. l. c. t. 6. f. 14. *Schwaegr.* Suppl. t. 296. *Br. and Schimper*, Bryol. Eur. fasc. 1. p. 13. t. 6.

Hymenostomum obliquum *Wilson* in Eng. Bot. Suppl. t. 2831.

H. phascoides *Schimp. and Wils. MSS. Bryol. Eur.* fasc. 42. t. 1.

Astomum rostellatum *Bryol. Eur.* fasc. 43. t. 1.

Hab. On the dried beds of shallow pools. Mere, Cheshire, *W. Wilson.* Newcastle Town Moor, *Mr. Robinson* and *Mr. John Thornhill.* Sussex, *Mr. Mitten.* Fr. Autumn, Spring.

Stems 1—3 lines in length, simple or branched, cæspitose. Leaves spreading, entire, crisped when dry, lower ones lanceolate, upper ones linear-lanceolate, obtuse, nerve excurrent as a short mucro, margin plane, colour dull green. Capsule elliptical, olive-brown, on a pedicel little more than its own length, and generally overtopped by the perichætial leaves, rostellate, the beak or persistent lid about half as long as the capsule, oblique. Spores and inflorescence as in the last.

A smaller moss than *P. multicapsulare*, with a smaller elliptical capsule, and longer pedicel. It so nearly resembles *Hymenostomum squarrosum*, that the two may possibly be only varieties of one species. This resemblance has already been noticed in *Bryologia Europæa. P. rostellatum*, however, has shorter pedicels; and in our specimens the stems are more branched, and the perichætial leaves are longer. The form and texture of the leaves are exactly the same in both.

It is remarkable that Bridel and others assert that *Phascum rostellatum* was first discovered in Britain; but we have seen no authentic specimen of earlier date than 1832; and even that is referred to a different genus, in *Bryol. Eur.*

SUBORDER II. WEISSIEÆ.

The WEISSIEÆ are allied on the one hand to *Trichostomeæ*, and on the other to *Dicraneæ*.

5. GYMNOSTOMUM. Beardless Moss.

GYMNOSTOMUM *Hedwig, Schwaegr. &c.*
HYMENOSTOMUM *R. Brown, Bruch and Schimper, &c.*

Capsule erect, on a straight fruitstalk, oblong, oval, ovate, or roundish, smooth, in a few species (*Hymenostomum*, partly), much contracted at the mouth, symmetrical, or sometimes a little oblique and curved. *Peristome* none; but, in some of the species of *Hymenostomum*, the top of the sporangium remains attached to the apex of the columella, thus forming a closed sac at the period of maturity. *Annulus* persistent and obscure in most of the species. *Lid* with an inclined beak, varying in length, conical at the base. *Calyptra* cucullate, beaked, extending below the operculum. *Spores* small. *Vaginula* oblong.

Perennial, growing on rocks, or on the soil; cæspitose;

branched in a dichotomous or fastigiate manner; dwarfish, or elongated. *Leaves* lanceolate, or linear-lanceolate, spreading, when dry crisped, or erect and nearly straight, nerved, margin inflexed, plane or recurved, entire, areolæ small, dense. *Inflorescence* dioicous, or monoicous. *Flowers* terminal at first; barren flowers gemmiform; in the monoicous species ultimately placed near the base of the perichætium. *Anthers* and *archegonia* with paraphyses.

Closely allied to *Weissia*, differing only in the absence of a peristome. Name from *γυμνος*, *naked*, and *στωμα*, *mouth*.

After very close examination of the subject, we consider it right to discard the genus *Hymenostomum*, for the following reasons. It is only where the capsule is very much contracted at the mouth, that the character, derived from the union of the sporangium with the apex of the columella, is apparent at the time of the dehiscence of the lid: in two of the species described in the *Bryologia Europea* (*H. tortile* and *H. crispatum*), it is not to be found at that period, and the structure of the parts is altogether the same in every species of *Gymnostomum*, if compared while the fruit is in an unripe state; even in ripe specimens of *Gymnostomum xanthocarpum* Hook. (which is closely allied to *G. curvirostrum*), the sporangium remains in union with the apex of the columella. Hence we infer that the character on which *Hymenostomum* rests is merely accidental, depending either upon the toughness of the membrane of the sporangium, or upon the less degree in which the columella contracts when drying. In the typical species of *Hymenostomum*, the aperture of the capsule is very much contracted by a thickening of the wall at that part, the inner layers of cells forming a horizontal ring, so that the orifice, bounded by a circle of 16 cellules, is barely sufficient to give egress to the spores. It will not be objected that this reunion of the two genera is opposed by the fact that their inflorescence and place of growth are different, so long as the genus *Weissia* is constructed with similar latitude.

Mr. Valentine has published some very interesting remarks on *Hymenostomum* in the *Muscologia Nottinghamiensis* (1833), and in *Lin. Trans.* vol. 17. p. 471., giving a more accurate view of the structure than had previously appeared: in the former work, however, the true diaphragm is confounded with the horizontal ring which surrounds the real aperture of the capsule; due care not having been taken to distinguish or to define the terms "stoma" and "aperture." If the term "aperture" be confined, as it ought to be, to the space surrounded by what is called the "marginal portion of the diaphragm," it is closed by the apex of the columella in conjunction with the membrane of the sporangium; but if that term (aperture) be applied to the entire space covered by the operculum, it ceases to be intelligible, and the so-called *diaphragm*, instead of being a single membrane, is composed of two distinct membranes, of which only the external annular one comes under the designation of "peristome" in the generic character given by Mr. Valentine, a name which is quite inapplicable if we include *Gymnostomum tortile* in the same genus. The ring itself is analogous to what, in numerous mosses, forms the cellular inflexed base of the true peristome.

SECT. I. *Inflorescence dioicous; leaves scarcely crisped when dry, the margin reflexed or plane, never incurved.*

a. Stems short; perichætial leaves sheathing; capsule eliptic-oblong, narrow at the mouth, lid conical, annulus large. *Gymnoweissia.*

3. 1. *Gymnostomum tenue* Schrad. (*slender Beardless Moss*); stems cæspitose; leaves lingulate, obtuse, those of the perichætium sheathing in the lower half; capsule oblong; lid shortly conical. (TAB. VII.)

G. tenue *Schrad.* Coll. Plant. Crypt. No. 31. *Hedw.* Sp. M. p. 37. t. 4. *Web. and Mohr.* Tasch. p. 86. *Nees and Hornsch.* Br. Germ. i. 151. t. 10. f. 14. *Brid.* Br. Univ. *Hook and Tayl.* *Bruch and Schimp.* Br. Europ. Monogr. p. 5. t. 2. Weissia tenuis *C. Müller,* Syn. Musc.
G. paucifolium *Eng. Bot.* t. 2506 (?) "Lid beaked."
Dicranum cylindricum *Smith,* Fl. Brit. p. 1221.
Bryum paucifolium *Dicks.* Cr. Fasc. t. 11. f. 3. (According to specimens, without lid, in Herb. Turner.)

Hab. On sandstone rocks and walls, not common. Cheshire. Near Glasgow, *Mr. Lyon.* Fr. July, August.

Stems very short, growing in broad light-green patches. Leaves suberect and a little recurved, when dry more erect, lingulate, obtuse, the upper ones the longest and more lanceolate, flattish, entire, or the marginal cells somewhat prominent and granulose, the nerve ceasing below the apex. Perichætial leaves larger than the rest, ovate-lanceolate, convolute. Pedicel about 3 lines in length, pale yellowish, twisted to the right hand when dry. Capsule pale reddish-brown, the mouth reddish, a little contracted, somewhat furrowed when old and empty. Annulus persistent.

G. bicolor of Bruch and Schimper is allied to this, and differs in the acute, lanceolate, more spreading and recurved leaves. It is also exceedingly like *Weissia reflexa* Bridel, in every thing but the total absence of a peristome. *G. calcareum* Nees and Hornsch, differs from *G. tenue* in the rostrate lid, and belongs to the next section of the genus (compare *Bryum paucifolium* Dicks and Smith, above cited, which is said to have a rostrate lid). It is unknown to us as a British species.

b. Stems taller, much branched; perichætial leaves slightly sheathing; capsule ovate or oval, truncated; lid with a long beak; annulus narrow, persistent.

4. 2. *Gymnostomum rupestre* Schwaegr. (*rock Beardless Moss*); stems densely tufted, slender, elongated, dichotomously

branched, leaves subfasciculate, spreading, rather rigid, linear-lanceolate, rather obtuse, carinate, the nerve ceasing below the apex; capsule erect, oval; lid conical, shortly beaked. (TAB. XXXII.)

G. rupestre *Schwaegr.* Suppl. I. 1. 31. t. 11. *Nees and Hornsch.* Br. Germ. i. 155. t. 10. f. 16. *Bridel. Hook. and Taylor.*

G. æruginosum *Smith,* Fl. Brit. p. 1163. Eng. Bot. t. 2200.

G. articulatum *Nees and Hornsch.* Br. Germ. i. 156. t. 10. f. 17.

G. erythrostomum, *Bridel.* Bryum fasciculatum *Dickson,* Crypt. fasc. 3. 3.

Weissia rupestris *C. Müller,* Syn. Musc.

var. β. ramosissimum, densely tufted and compact; leaves shorter, rather obtuse; capsule smaller, on a shorter pedicel.

var. γ. stelligerum; loosely tufted; leaves, at the extremity of the branches, much fascicled and stellato-patent, subrecurved, linear-lanceolate, rather acute.

G. stelligerum *Nees and Hornsch.* Br. Germ. i. 168. t. 11. f. 23. (not *Smith* nor *Dickson*).

var. δ. compactum; leaves fascicled, longer and more obtuse.

Hab. Wet rocks, in alpine and subalpine situations, not uncommon. Fr. Autumn.

Stems crowded and cæspitose, 1 or 2 inches long, branched, rooting in the axillæ of the branches. Leaves crowded, more or less spreading, when dry erect and somewhat inflexed, upper ones the largest, and more or less fascicled, dark green, rather rigid, carinate, entire, the nerve ceasing below the rather obtuse apex; perichætial leaves wider at the base, and somewhat sheathing. Capsule oval or oblong, of thin membranous texture, truncated after the lid falls away, the mouth reddish, elsewhere brownish and shining. Lid shorter than the capsule, with a shorter beak than the next species.

The smaller forms of this resemble *G. calcareum*, and the larger are sometimes apt to be confounded with the following, from which, however, it is sufficiently distinct. There is reason to suspect that *Weissia verticillata* has been confounded with *G. rupestre*, to constitute *G. æruginosum* of Smith.

35. 3. *Gymnostomum curvirostrum* Hedw. (*curve-beaked Beardless Moss*); stems densely cæspitose, elongated, branched; branches fastigiate; leaves spreading, linear-lanceolate, acute, carinate, entire with recurved margins; capsule broadly ovate, lid obliquely rostrate, longer than the capsule and adherent to the columella. (TAB. VI.)

G. curvirostrum *Hedw.* St. Crypt. t. 34. *Nees and Hornsch.* Br. Germ. I. 170. t. 11. f. 24. *Smith,* Fl. Brit. p. 1164. *Eng. Bot.* t. 2214. *Bridel. Hook. and Tayl. Bruch and Schimp.* Bryol. Eur. Monogr. p. 8. t. 7, 8.

Weissia curvirostris *C. Müller*, Syn. Musc.
G. æruginatum *Nees and Hornsch.* Bryol. Germ. i. 160. t. 10. f. 19. (not *Smith*).
G. stelligerum *Smith*, Eng. Bot. t. 2202. Fl. Brit. 1164. *Dicks.* Crypt. fasc. 2, 3. t. 4. f. 4. (barren-fl. plant).

var. β. pomiforme; leaves thinner and narrower; capsule roundish-obovate.
G. pomiforme *Nees and Hornsch.* l. c. 158. t. 10. f. 18.

var. γ. microcarpon; more densely cæspitose; leaves broader, erecto-patent, capsule roundish-obovate, smaller. *Nees and Hornsch.* p. 161. t. 10. f. 20.

var. δ. pallidisetum; stem elongated, slender, much branched, leaves fascicled, spreading, tender; capsule small, obovate, on a shorter pedicel; lid with a shorter beak.
G. pallidisetum and G. brevisetum *Nees and Hornsch.* p. 166, 164. t. 10, 11. f. 21, 22.

Hab. Moist rocks, in alpine and subalpine situations.
Fr. Autumn.

Stems branched in a fascicled or fastigiate manner, fragile, beset with rooting fibres nearly to the top. Leaves spreading, variously curved, when dry erect, slightly incurved, scarcely twisted, concave at the base, more acute than in the last, the margin recurved, nerve ceasing below the apex. Capsule ovate, obovate, or roundish, of thicker texture than the last, chestnut-coloured, shining. Annulus a double row of cells. Lid with a very long slender inclined beak, conical at the base, adhering to the columella.

The difference between this and the preceding is sufficiently obvious if due attention be paid to the long persistent lid, and to the acute leaves with recurved margins. Nevertheless, it is highly probable that the two have been confounded by Smith in *Eng. Bot.*, and also by Dickson and others.

G. æruginosum seems to be peculiar to certain calcareous rocks, where a deposit of tufa occurs during the growth of the plant. Dickson's moss, so called, is *Eucladium verticillatum* of Br. and Sch.

G. xanthocarpum Hook., an East Indian species, is very nearly allied to this, and the two appear to have been confounded in *Musci Indici.* (*Journ. Bot.* 1840, vol. 2. p. 1.)

SECT. II. *Inflorescence monoicous; leaves crisped when dry, their margins incurved, or plane, never reflexed.*

a. Capsule contracted at the mouth; sporangium united to the apex of the columella, and forming a closed sac. *Hymenostomum.*

4. *Gymnostomum squarrosum* (*spreading-leaved Beardless Moss*); stems elongated, loosely tufted; leaves squarrose, linear-lanceolate, with plane margins, crisped when dry; capsule ovate or elliptical, exserted; lid rostrate. (TAB. XXXVIII.)
Hymenostomum squarrosum *Nees and Hornsch.* Bryol. Germ. i. p. 193. t. 12. f. 1. *Bryol. Eur.* Monogr. p. 5. t. 2.

Weissia squarrosa *C. Müller*, Syn. Musc.

Hab. In fields, and on clayey banks; not unfrequent in Lancashire and Cheshire. Sussex, *Mr. Mitten.*

Fr. Autumn, Spring.

Stems about ¼ inch long, arising from the axillæ of the leaves of the prostrate stem of the preceding year, slender. Leaves distant, squarrose, blunt, with a mucro formed of the excurrent nerve. Capsule smaller than that of *G. microstomum*, variable in shape, sometimes oblique and unequal, on a pedicel taller than the perichætial leaves.

This differs from *G. microstomum* in the plane margins and mucronate points of the squarrose leaves. In habit it approaches nearly to *Weissia mucronata*, but differs in the shorter pedicel, and in the structure and colour of the capsule.

Ref. to figures.—1. plants, *nat. size.* 2. portion of plant, magnified. 3. leaves, magnified. *a.l.* apex of leaf, much magnified. *s.l.* section of leaf. *a.* mouth of capsule, vertical view. *b.* section of upper part of capsule, after removal of the lid.

37. 5. *Gymnostomum microstomum* Hedw. (*small-mouthed Beardless Moss*); stems short, densely tufted; leaves lanceolate, or linear-lanceolate, with incurved margins, acute, much crisped when dry; capsule elliptical (sometimes oblique and gibbous), or elliptic-oblong, olivaceous, much contracted at the mouth; lid rostrate. (Tab. VII.)

Gymnost. microstomum *Hedw.* St. Crypt. iii. p. 71. t. 30. Sp. Musc. p. 33. *Web. and Mohr. Roehl. Smith,* Fl. Brit. 1165. Eng. Bot. t. 2215. *Hook. and Tayl.*

Hymenostomum microstomum *R. Brown*, Lin. Trans. xii. p. 573. *Nees and Hornsch.* Br. Germ. i. 199. t. 12. f. 4. *Bridel. Bruch and Schimp.* Br. Eur. Monogr. p. 4. t. 1.

Weissia microstoma *C. Müller*, Syn. Musc.

var. β. obliquum; capsule oblong, incurved; operculum conical, subrostrate.

H. obliquum *Nees and Hornsch.* l. c. p. 194. t. 12. f. 2.

var. γ. brevirostre; capsule oblong, symmetrical; operculum conical.

Gymnost. sepincola *Funk.*

var. δ. brachycarpum; capsule with a shorter pedicel, roundish, and gibbous.

H. brachycarpum *Nees and Hornsch.* l. c. 169. t. 12. f. 3.

var. ε. elatum; innovations overtopping the fruit; capsule smaller, roundish; operculum subrostrate.

Hab. In fields and on banks, &c. Fr. Spring.

Stems not ½ inch in height, often less, branched; branches fastigiate. Leaves spreading, recurved below, incurved above, when dry twisted and crisped, lower ones lanceolate, often plane in the margin, upper ones twice or thrice as long, linear-lanceolate, tapering and acute, the margins much incurved, nerve excurrent. Capsule variable in shape, oval, or elliptic-oblong, symmetrical, or at times oblique, of a pale olive brown colour when dry and fully ripe, on a longer pedicel than the last, the mouth very small. Sporangium united to the apex of the columella; hence the spores do not escape until the membrane becomes ruptured, long after the fall of the operculum. Operculum variable in length, mostly rostrate. Spores as in *G. squarrosum.* Barren and fertile flowers placed near each other.

The incurved margins of the perichætial leaves constitute the principal character whereby this species, if really such, is to be distinguished from *G. squarrosum.* We have found them growing in company; but further experience is necessary to show whether the characters are constant.

b. Capsule scarcely contracted at the mouth. Sporangium not adherent to the apex of the columella.

8, 6. *Gymnostomum tortile* Schwaegr. (*curly-leaved Beardless Moss*); stems densely tufted, elongated, branched; branches fastigiate; leaves crowded, suberect or spreading, curved in the upper part, incurved and slightly crisped when dry, oblong-lanceolate with incurved margins, obtuse, apiculate, strongly nerved, capsule elliptical; lid rostrate. (TAB. XXXVIII.)

Gymnostomum tortile *Schwaegr.* Suppl. I. 1. 29. t. 10. *Nees and Hornsch.* l. c. 182. t. 11. f. 28. *Bridel,* Br. Univ.
G. condensatum *Voit. Roehl.*
Hymenostomum tortile. *Bruch and Schimp.* Br. Eur. Monog. p. 6. t. 3, 4.
Weissia tortilis *C. Müller,* Syn. Musc.
var. β. subcylindricum; leaves narrower, linear-lanceolate, capsule oblong.

Hab. On limestone rocks, Derbyshire. Chalk cliffs, Sussex, *Mr. Mitten.* St. Michael's Mount, Cornwall, *Mr. Greenwood.*
Fr. Spring.

A more robust species than the last, easily known by sit firmer leaves, which have a very strong reddish nerve, and are less contorted when dry; also by the larger capsule, of a paler colour, with a larger mouth of a purple colour. The spores are only half the diameter of those of *G. microstomum.*

Our British specimens in the foliage belong rather to the var. *β.*; but the capsules are those of the typical form, which has the leaves more obtuse, and the nerve scarcely excurrent. A careful examination of the capsule of this species will show that the genus *Hymenostomum* is not essentially distinct from *Gymnostomum.*

Gymnost. phascoides Drummond, *Musc. Am.* No. 12., is allied to this in the foliage, but differs in having a roundish immersed capsule, and a short stem.

Hymenostomum crispatum Bruch and Schimper, appears to differ from the var. *ε.* of *Weissia controversa* in very little else than in the total absence of a peristome, and it is doubtful whether this character is sufficient. We have formerly entertained a suspicion that all the *Hymenostoma* might be only variations of *Weissia controversa,* and it must be acknowledged that they are very closely allied. Mr. Valentine's argument to the contrary (in *Musc. Nottingh.*) is not conclusive.

6. WEISSIA *Hedwig.*

WEISIA and EUCLADIUM *Bruch and Schimper.*

Capsule erect, oblong-ovate, or subcylindrical, on a long straight fruitstalk; *lid* with an inclined beak; *annulus* persistent; *peristome* simple; *teeth* 16, equidistant, mostly free at the base, lanceolate or linear-lanceolate, transversely barred and convex externally, without a medial line, entire or perforated, sometimes bifid at the apex, erect or spreading when dry.

Perennial, growing on soil, cæspitose, branches dichotomous or fastigiate. Leaves octofarious, spreading, curved and crisped when dry, lanceolate or linear-lanceolate, nerved, areolæ small. *Inflorescence* monoicous or dioicous, sometimes synoicous. Allied to *Hymenostomum* and *Gymnostomum*, on the one hand, and to *Didymodon* on the other. Name in honour of Weiss, a Cryptogamic botanist of Gottingen. Several mosses included in this genus in former editions have been removed (see *Rhabdoweissia, Blindia, Seligeria, Brachyodus*) for the sake of natural arrangement.

SECT. I. *Leaves channelled, linear-lanceolate, acute, entire, incurved or crisped when dry; no distinct perichætium; peristome variable; seta when dry twisted to the right hand.* CONTROVERSÆ. *Microweisia* Br. and Sch.

Flowers monoicous, gemmiform.

39. 1. *Weissia controversa* Hedw. (*green-tufted Weissia*); stem more or less branched; lower leaves lanceolate, upper leaves linear-lanceolate, incurved or involute in the margin, nerve slightly excurrent; capsule oval or ovate-oblong, erect; operculum conico-rostrate; annulus narrow. (TAB. XV.)

W. controversa *Hedw.* Stirp. Crypt. t. 5. *Hook and Tayl.* Musc. Brit., and of most authors.

W. microdonta *Hedw.* Sp. M. t. 11. W. humilis, fallax, and Bruchiana *Nees and Hornsch.* Bryol. Germ. t. 26. and 28. Dicranum xanthodon *Hedw.* Sp. M. t. 30. Grimmia controversa *Web. and Mohr.* Bot. Tasch. *Smith,* Fl. Brit. 1177. Eng. Bot. t. 1367. *Turn.* Musc. Hib. p. 27. Bryum virens *Dicks.* Dill. Musc. t. 48. f. 43. (partly).

W. viridula *Bridel. Bruch and Schimper.* Bryol. Europ. Monogr. p. 5. t. 2, 3. (not of *Linnæus*).

var. β. stenocarpa; capsule narrow, subcylindrical. (var. γ. of *Nees and Hornsch.* Bryol. Germ. t. 17.)

var. γ. densifolia; taller and densely tufted; stems much branched; leaves crowded, narrower; teeth of the peristome less perfect. W. densifolia *Wils. MSS.*

var. δ. amblyodon; leaves linear-lanceolate or oblong-lanceolate; teeth of the peristome variable, very short and truncate, acute or cloven at the apex, pale or yellowish.

W. amblyodon *Brid.* Bryol. Univ. 1. 805. *Nees and Hornsch.* Bryol. Germ. t. 25.
W. gymnostomoides and microstoma *Nees and Hornsch.* Bryol. Germ. t. 25. and 37.

var. ε. gymnostomoides; teeth of the peristome almost wanting, pale.

W. gymnostomoides *Brid.* Bryol. Univ. 1. 342. W. Rudolphiana *Nees and Hornsch.* l. c. t. 25.

Hab. Banks &c. frequent. Var. γ. on shady rocks in Nant Bwlch yr Haiarn, near Llanrwst. Spring.

This is easily distinguished from *W. cirrata* and *W. crispula* by the involute margins of the leaves, which closely resemble those of *Gymnostomum microstomum.* The peristome (nearly wanting in the var. ε.) constitutes almost the only character by which it can be kept separate from that moss and its allies, especially *Hymenostomum crispatum* Nees and Hornsch. and Bruch and Schimp. *W. Wimmeriana* of Br. and Sch., not yet observed in Britain, has androgynous flowers, a narrower capsule, longer operculum, broader annulus, and pale rudimentary peristome.

We retain the name given by Hedwig, because (as Dickson justly observes) Bridel and other authors have erroneously referred the Linnæan synonym *Bryum viridulum* to this species, in consequence of a previous misquotation by Linnæus of the Dillenian synonym. We are assured by Sir J. E. Smith (in *Eng. Bot.*) that "the present plant was, in fact, unknown to Linnæus, though common throughout Europe."

2. *Weissia mucronata* Bruch and Sch. (*point-leaved Weissia*); leaves lanceolate or linear-lanceolate, almost plane-margined, mucronate, the nerve slightly excurrent; capsule oblong, obscurely striated; teeth of the peristome short, truncate, perforated and fugacious. (Tab. XXXVIII.)

W. mucronata *Br. and Sch.* Bryol. Europ. Monogr. p. 7. t. 4.
W. apiculata *Nees and Hornsch.* Bryol. Germ. t. 26. Hymenostomum rutilans *Ibid.* t. 12. Gymnostomum rutilans *Hedw.* Sp. M. t. 3.

Hab. In fallow ground, especially in a clayey soil, not frequent. March, April.

Very similar to *W. controversa*, but the leaves almost plane, and the nerve more prominent and mucro-like at the apex; capsule longer and more evidently striated; peristome fugacious (*v. fig. a.b.*), and the spores twice or thrice as large.

Sect. II. *Stem taller; leaves entire, much crisped when dry; perichætium evident; teeth of the peristome longer and more regularly formed; flowers monoicous, gemmiform.* Crispulæ. *Weisia* Br. and Sch. *Blindia* C. Muller.

3. *Weissia cirrhata* Hedw. (*bent-leaved Weissia*); stems loosely tufted; leaves linear-lanceolate, spreading, subflexuose,

carinato-concave, reflexed in the margin, perichætial leaves shorter and somewhat sheathing; capsule oval-oblong, subcylindrical, with an annulus; lid with a long beak. (Tab. XV.)

W. cirrhata *Hedw.* Sp. M. t. 12. *Hook and Tayl.* (and of most authors). *Bruch and Schimp.* Bryol. Eur. Monogr. p. 9. t. 6.
Blindia cirrhata *C. Müller*, Syn. Musc. ii. 585.
Grimmia Dicksoni *Smith*, Fl. Brit. p. 1189. Eng. Bot. t. 1420.
Bryum cirratum *Hudson? With.? Hull? Lightf.?*
Mnium cirratum *Linn.* *Dill.* Musc. t. 48. f. 42. (and f. 43. F.)

Hab. On posts and rails, also on rocks in mountainous districts.

This is known by the reflexed entire margins of the leaves. The teeth of the peristome are inserted considerably below the mouth of the capsule and externally trabeculated. The capsule is pale brown, purplish, and contracted at the mouth, smooth, of thin texture, varying in form; when growing on posts it is shortly oval, when on rocks it is longer and almost cylindrical. The reason assigned by Smith for retaining Willdenow's name, *Dicksoni*, is unsatisfactory, and not very intelligible. Dickson's specimen, figured in *English Botany*, t. 2356, as *Weissia cirrata*, is certainly *Cynodontium Bruntoni*, a species which even Mr. Brunton himself has confounded with *W. cirrata*, in *Herb. Turner*, but which may be known by its shorter wide-mouthed capsule, and by its subdenticulate leaves of closer texture.

42. 4. *Weissia crispula* Hedw. (*curly-leaved Weissia*); stems tufted, branched; leaves spreading, variously curved, often falcato-secund, crisped when dry, lanceolate-subulate from a wider concave base, channelled above, margin plane; capsule oval or oblong-ovate; annulus none; lid rostrate. (Tab. XV.)

W. crispula. *Hedw.* Sp. Musc. t. 12. *Hook. and Tayl.* &c. *Bruch and Schimp.* Bryol. Eur. Monogr. p. 9. t. 7.
Blindia crispula *C. Müller*, Syn. Musc. ii. 584.
W. falcata *Nees and Hornsch.* Byrol. Germ. t. 31. f. 16.
Grimmia crispula *Turner*, Musc. Hib. p. 28. *Smith*, Fl. Brit. 1192. Eng. Bot. t. 2203.
Dicranum interruptum *Bridel,* Br. Univ. 1. 438.? Dill. Musc. t. 47. f. 38.

Hab. On rocks in mountainous districts. Fr. June, July.

The evident perichætium, and the plane (not reflexed) margins of the leaves, distinguish this moss from *Weissia cirrata*, with which it agrees in the mode of insertion of the peristome. In the falcate leaves and general aspect it may easily be mistaken for a *Dicranum*; and if the Dillenian synonym has been correctly applied by Bridel, it follows that *Dicranum interruptum* Bridel, belongs to this moss, and not to *Dicranum fulvum* Hook. *Musc. Exot.*, a species which has never been found in Britain. The *var. β. atrata* Br. & Sch. with shorter blackish leaves, is an alpine form found on dripping rocks.

SECT. III. *Stem elongated; leaves rigid, not crisped when dry, very narrow, strongly nerved, denticulate near the base; teeth of the peristome inclined towards the right hand, plane, not transversely barred, confluent at the base, somewhat incurved when dry, fragile, deciduous; inflorescence dioicous, terminal.* EUCLADIUM Br. and Schimp.

3. 5. *Weissia verticillata* Brid. (*whorled Weissia*); stems elongated; branches fastigiate; leaves crowded, suberect, linear-lanceolate, toothed near the base, margin plane; nerve strong, slightly excurrent; teeth of the peristome oblique; lid rostrate. (TAB. XV.)

Weissia verticillata *Bridel*, Sp. M. p. 121. *Schwaegr.* Suppl. I. 1. 71. t. 20. *Nees and Hornsch.* Bryol. Germ. t. 32. *Hook and Tayl.* *C. Müller,* Syn. Musc.
Grimmia verticillata *Turner*, Musc. Hib. *Smith*, Fl. Brit. Eng. Bot. t. 1258.
Coscinodon verticillatus *Bridel*, Bryol. Univ. 1. 374.
Eucladium verticillatum *Br. and Schimp.* Bryol. Eur. Monogr. p. 3. t. 1.
Bryum verticillatum *Lin.* Sp. Pl. 1585. *Dill.* Musc. t. 47. f. 35.

Hab. On dripping rocks, chiefly on such as are calcareous.
Fr. June, July.

Stems densely cæspitose, usually incrusted with a calcareous deposit. Leaves of a glaucous hue, very narrow, nearly erect, not much altered when dry, distinctly toothed near the slightly sheathing and dilated base; nerve strong and distinct. Perichætial leaves larger and more dilated at the base. Capsule erect, oval, glossy, reddish. Annulus simple, obscure, fragmentary. Teeth of the peristome entire or perforated, slightly oblique, inserted below the mouth of the capsule. Calyptra cucullate, yellowish. Spores small.

This species is easily recognised by its narrow, rigid, strongly nerved leaves. It bears some resemblance to *Gymnostomum curvirostrum* and *G. rupestre*, to which belongs the Dicksonian *Bryum fasciculatum,* erroneously cited by Smith and Bridel as a synonym of *Weissia verticillata.*

The generic name *Eucladium* being pre-occupied, we have the less hesitation in restoring this to its former place among the *Weissiæ.* The characters of *Eucladium* as a genus are given in the description of this section of the genus *Weissia.*

The inclined teeth (to the right, not left, as stated in *Bryol. Europ.*) are analogous to those of *Trichostomum rigidulum.*

To disentangle the stems without fracture, they should be immersed for a time in diluted nitric acid, which dissolves the earthy matter. By this mode the brittle species of *Chara* may also be preserved.

7. RHABDOWEISSIA *Br. and Schimp.* Streak-Moss.

WEISSIA *Hook and Tayl.* (partly).

Capsule erect, on a rather short slender straight fruitstalk, small, shortly oval, with 8 longitudinal striæ, furrowed when dry. *Peristome* simple; *teeth* 16, lanceolate or subulate, numerously articulated, barred internally, without a medial line, hygroscopic, red. *Annulus* persistent, very narrow. *Lid* with a slender inclined beak. *Calyptra* cucullate. *Spores* rather small. *Vaginula* oblong.

Perennial, dwarfish, growing on rocks and on the ground, in alpine or subalpine situations. *Stems* dichotomous, fastigiate, erect, rooting at the base, and in the axillæ of the leaves. *Leaves* crowded, spreading every way, curved, crisped when dry, linear-lanceolate, carinate, nerved (nerve round), denticulate near the apex, more or less papillose; *areolæ* pellucid and oblong-hexagonal at the base, smaller upwards, subquadrate, and filled with chlorophyll. *Inflorescence* monoicous; *flowers* terminal, gemmiform; *archegonia* very small, without paraphyses.

Rhabdoweissia (*striated Weissia*, from ραβδος, *striæ*, and *Weissia*) in habit and size resembles *Weissia controversa*, and in the peristome is like *W. crispula*. In the form and texture of the leaves and in the striated capsule, the genus is allied to *Dicranum polycarpum*, of which it may be considered a miniature resemblance.

Sect. I. *Teeth of the peristome fugacious, subulate.*

44. 1. *Rhabdoweissia fugax* Br and Sch. (*dwarf Streak-Moss*); stems tufted; leaves linear-lanceolate, acute, nearly entire, with plane margins; capsule roundish-oval, lid with a long beak. (Tab. XV.)

Bryol. Europ. Monogr. p. 4. t. 1.
Weissia fugax *Hedw.* Sp. Musc. t. 13. *Schwaegr. Bridel. Nees and Hornsch. C. Müller,* Syn. Musc.
W. striata *Kaulf in Sturm.* Fl. Germ. t. 24.
W. striata α. minor *Hook and Tayl.*
W. pumila and W. leptodon *Brid.* Bryol. Univ. i. p. 338. and 341.
Grimmia striata *Web. and Mohr. Smith,* Eng. Bot. t. 1988.

Hab. In crevices of rocks, and on moist banks, in subalpine districts. June, July.

Distinguished from the next species by the narrower almost entire leaves, and by the fugacious peristome. It forms larger tufts than its allies. Stems from ¼ to ½ inch long. Leaves crowded, resupinate, and recurved, crisped when dry, keeled. Capsule obscurely striated. Teeth of the peristome subulate, very narrow, almost capilliform, dilated at the base, sometimes perforated. Lid obliquely rostrate, longer than the capsule.

Rh. Schisti (*Weissia Schisti* Schwaegr.) differs from this species in its leaves, which are papillose or granular on both sides, and crenulate in the margin; in the capsule, which is longer and apophysate; in the lid, which is shorter; and in the broad teeth of the persistent peristome. This rare species is not known to have been found in Britain, unless

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Grimmia Schisti of Eng. Bot. t. 1952. be regarded as evidence of the fact; and that figure represents the leaves too narrow.

SECT. II. *Teeth of the peristome lanceolate, more firm and persistent.*

5. 2. *Rhabdoweissia denticulata* Br. and Sch. (*toothed Streak-Moss*); stems loosely cæspitose, leaves linear-lanceolate, or lingulate, coarsely serrated at the apex, slightly crisped when dry; capsule with a more evident apophysis. (TAB. XV.)

Bryol. Europ. Monogr. p. 5. t. 2.
  Weissia denticulata *Bridel.* *Schwaegr.* Suppl. t. 19. *Nees and Hornsch.* Bryol. Germ. t. 31. *C. Müller,* Syn. Musc.
  Weissia striata β. major *Hooker and Taylor.*
  Bryum glaucescens *Dickson.* (*Herb. Turner.*)
  B. crispatum *Dicks.* Crypt. fasc. 3. p. 3. t. 7. f. 4.

Hab. In crevices of alpine and subalpine rocks.

Stems longer and more robust than in *R. fugax*; the leaves longer, wider, with larger cellules, less crisped when dry, and somewhat glossy. Capsule less rigid, when dry more distinctly furrowed. Peristome larger, the teeth lanceolate, more solid and persistent, by which character it is easily distinguished from the other species. Of Dickson's *Bryum crispatum* we have seen no authentic specimen, and the figure is not very expressive.

SUBORD. III. CAMPYLOSTELEÆ.

The characters of this suborder are not well ascertained. So far as they are understood, they may be found in the description of the genus *Campylostelium*; but *Brachyodus*, the other genus referred to this group by Bruch and Schimper, presents a considerable deviation in the straight fruitstalk, and indeed it may be questioned whether *Brachyodus* has not a closer affinity with the *Seligerieæ*.

8. CAMPYLOSTELIUM *Br. and Sch.*

GRIMMIA *Hook. and Tayl.*

Capsule drooping, on a geniculate pedicel, oblong, its walls thin and membranaceous, without striæ. *Lid* long, subulate. *Calyptra* conico-subulate, 5-cleft at the base, covering the lid. *Annulus* double. *Peristome* single; *teeth* 16, lanceolate, long, trabeculate, reddish, entire at the base, and connected by a membrane rising above the orifice of the capsule, cloven in the upper part, the segments unequal and incurved when dry. *Vaginula* cylindrical. *Spores* small.

Stem very short, simple, or with forked or three-branched innovations. *Leaves* elongated, linear-lanceolate, narrow, crowded, nerved, entire; *areolæ* dot-like, much larger and colourless at the base of the leaf. *Inflorescence* monoicous; *barren flower* gemmiform, terminal on a lateral branch.

Plants very small and slender, loosely tufted, growing usually upon detached rocks, bi-triennial; allied to the *Seligerieæ* in the mode of growth, but in the structure of the calyptra, in the peristome, and in the curvature of the fruitstalk, approaching to *Campylopus.* The calyptra and peristome are not unlike those of some species of *Grimmia* or *Dryptodon;* but in other respects there is no affinity. Name from καμπυλος, *curved*, and στηλη, *pillar*, or *fruitstalk.*

46. *Campylostelium saxicola* Br. and Sch. (Tab. XIII.)
Bryol. Europ. Monogr. p. 3. t. 1.
Campylopus saxicola *Brid.* Mant. Musc.
Dicranum saxicola *Web. and Mohr.*
Dryptodon saxicola *Brid.* Bryol. Univ. i. 770.
Grimmia saxicola *Hook. and Tayl.* *Hook.* in Eng. Bot. Suppl. t. 2627.
Grimmia geniculata *Schwaegr.* Suppl. t. 22. *Brid.* Bryol. Univ. i. 189.

Hab. On sandstone rocks, &c., rare. Blackdown, Sussex, *Mr. Borrer.* Near Crich, and near Rowsley, Derbyshire, *W. Wilson.* Near York, *Mr. Spruce.* Near Todmorden, *Mr. John Nowell.* Granite rocks in the Dublin Mountains.. Nov.

Stems gregarious, very short. Leaves linear-lanceolate, keeled, margin plane, twisted when dry. Fruitstalk geniculate. Capsule elliptic-oblong, pale. Teeth of the peristome more or less deeply cloven.

The only species, for a fuller description of which see the generic character. It is distinguished from all other mosses with geniculate setæ by the twisted linear leaves, and from all the British species, except *Dicranodontium longirostre*, by the smooth, oblong capsule.

9. BRACHYODUS *Nees and Hornsch.*

Weissia *Hook. and Tayl.*

Calyptra conical, 3—5 lobed at the base, subdimidiate. *Capsule* erect, on a straight pedicel, very small, oblong, subapophysate, its walls thin, substriate, furrowed when dry. *Annulus* broad. *Lid* convex at the base, with a slender beak. *Peristome* single; *teeth* 16, very short, truncate, equidistant, partly confluent, pale and fugacious, scarcely projecting above the annulus. *Spores* very small. *Vaginula* cylindrical.

Stems very short, at first simple, at length furnished with single or forked innovations. *Leaves* lanceolate-subulate, suberect, crowded; *areolæ* as in *Seligeria. Inflorescence* monoicous, terminal, gemmiform.

Plants very small, bi-triennial, growing on rocks, in habit and mode of growth allied to *Seligeria*, except that the stems are gregarious, not cæspitose; and to *Campylostelium* (according to Bruch and Schimper) in the form of the calyptra, in the organization of the peristome, and in the structure of the annulus, forming with that genus a group intermediate between the *Seligerieæ* and the *Dicraneæ*. Name from βραχυς, *short*, and οδους, *tooth.*

7. *Brachyodus trichodes* Nees and Hornsch. (*bristle-leaved Brachyodus*). (Tab. XV.)

Bryol. Germ. t. 25. *Bruch and Sch.* Bryol. Eur. Monogr. p. 3. t. 1.
Weissia trichodes *Hook. and Tayl.*
Grimmia trichodes *Eng. Bot.* t. 2563.
Gymnostomum Davallianum *Smith* in Schrad. Neu. Journ.
Gymnostomum trichodes *Web. and Mohr. Nees and Hornsch.* Bryol. Germ. t. 12. *Brid.* Bryol. Univ.
Anœctangium trichodes *Schwaegr.* Suppl. t. 10.

Hab. On subalpine rocks, chiefly of sandstone or granite.
Fr. Spring.

Stems gregarious, very small, and slender. Leaves lanceolato-subulate, almost setaceous, the nerve predominant, forming the upper portion of the leaf. Capsule erect, on a straight pedicel, oblong, furrowed when dry. Annulus large. Teeth of the peristome very short and truncated. The only species (see the description of the genus). It is readily distinguished from *Seligeria pusilla*, its nearest ally, by the striated erect capsule and very short peristome, which at first consists of a mere annular membrane, and has sometimes been mistaken for the proper annulus.

Subord. IV. SELIGERIEÆ.

This family, according to Bruch and Schimper, comprises three genera; *Seligeria*, *Anodus*, and *Blindia*. Of these we retain the two first, placing *Blindia* in the *Dicraneæ*. To avoid prolixity, we shall refer our readers to the descriptions of the genera for an idea of the respective suborders to which they are supposed to belong. There is much to be learned before the exact limits of each group can be ascertained; meanwhile it is our purpose to proceed on the plan laid down in the *Bryologia Europæa* in all cases where good reasons to the contrary do not appear.

10. SELIGERIA *Br. and Sch.* Bristle-Moss.

Weissia *Hook. and Tayl.*

Very small, almost stemless mosses (biennial?), growing upon rocks, in patches of a light-green colour.

Capsule roundish-pyriform, wide-mouthed, on a straight or curved pedicel. *Lid* large, obliquely rostrate. *Annulus* none. *Calyptra* cucullate, small. *Peristome* single; *teeth* 16, equidistant, lanceolate, obtuse, transversely articulate, smooth and entire, sometimes perforated, without any medial line, hygroscopic, but rather rigid and brittle. *Spores* rather small, smooth. *Vaginula* oblong.

Stem simple, putting out new shoots near the rooting base. *Leaves*, lower ones very small and scattered, ovate-lanceolate, scarcely nerved; upper ones larger, crowded, ovate-lanceolate at the base, with a long subulate prolongation wholly or nearly occupied by the nerve, rather straight and rigid, areolation dense, except at the base of the leaf. *Inflorescence* monoicous; *flowers* gemmiform, terminal; *antheridia* few, small, oblong, usually with paraphyses; *archegonia* few, with short styles, accompanied by paraphyses. Name, in honour of Seliger.

48. 1. *Seligeria pusilla* Br. and Sch. (*long-leaved Bristle-Moss*); stems very short, gregarious, or loosely cæspitose, simple or forked; leaves very narrow, lanceolato-subulate, subcrenulate near the middle; teeth remotely barred. (TAB. XV.)

Bryol. Europ. Monogr. p. 4. t. 1.
Weissia pusilla *Hedwig.* Stirp. Crypt. t. 29. *Schwaegr. Nees and Hornsch.* Bryol. Germ. t. 25. *Hook and Tayl. &c.*
Weissia Seligeri *Nees and Hornsch.* Bryol. Germ. t. 26. *Bridel.*
Grimmia pusilla and G. Seligeri *Web. and Mohr.*

Hab. On the steep sides of shady calcareous rocks, rare. Near Belfast, *Mr. Drummond.* Derbyshire. Near Malham, Yorkshire, *Mr. John Nowell.* Fr. April, May.

Distinguished from the next species by its slender habit and narrow leaves, which have a thinner nerve. Capsule very small, turbinate when dry. *W. Seligeri* is a mere variety, with longer and brighter coloured leaves.

49. 2. *Seligeria calcarea* Br. and Sch. (*short-leaved Bristle-Moss*); stems very short; leaves ovato-subulate, obtuse, the nerve thick and predominant; capsule on a thicker pedicel; lid with a shorter beak; teeth broader, densely barred, obtuse; spores larger.

Bryol. Europ. Monog. p. 4, 5. t. 1.
Weissia calcarea *Hedw.* Sp. M. t. 11. *Bridel. Nees and Hornsh.* Bryol. Germ. t. 31. f. 24. *Hook and Tayl.*
Grimmia calcarea *Smith. Turner.* Eng. Bot. t. 191.

Hab. On chalk cliffs, &c. Fr. April, May.

More robust than *S. pusilla.* Leaves shorter, with a more dilated base, obtuse, thicker and stronger, and of a dull green colour. Capsule larger, more solid, the fruitstalk thicker. A variety of this species occurs with longer and less obtuse leaves, approaching to *S. pusilla* *S. tristicha* (not found in Britain) differs in its 3-ranked leaves.

3. *Seligeria recurvata* Br. and Sch. (*curve-necked Bristle-Moss*); leaves lanceolato-subulate, acute; capsule drooping, on a curved pedicel. (Tab. XV.)

Bryol. Europ. Monogr. p. 6. t. 3.
Weissia recurvata *Bridel,* Bryol. Univ. i. 352. *Nees and Hornsch.* Bryol. Germ. t. 34. f. 27. *Hook and Tayl.*
Grimmia recurvata *Hedw.* Stirp. Cr. t. 38. *Smith,* Eng. Bot. t. 1489. *Turner, Schwaegr.,* &c.
Grimmia pusilla *Smith,* Eng. Bot. t. 2551. (*Dickson's Specimen in Herb. Turner.*)
Bryum curvatum *Dicks. Dill.* Musc. t. 49. f. 53.?

Hab. On rocks, chiefly of sandstone. Fr. April, May.

Stems 1—2 lines long, densely gregarious, brittle. Leaves somewhat flexuose, nerved, the nerve predominant or excurrent. Capsule on a longer curved pedicel, horizontal or subpendulous, erect when dry, roundish-pyriform, more loosely cellular than in other species, reddish at the mouth. Operculum less obliquely rostrate. Calyptra longer. It differs from *S. pusilla* in its larger size and curved fruit-stalk.

11. ANODUS *Br. and Sch.*

GYMNOSTOMUM *Hook. and Tayl.*

This genus, of which only one species is known, scarcely differs from *Seligeria* in any other respect than in the absence of a peristome. According to Bruch and Schimper, the two genera agree perfectly in the form of the leaves, in the cellular tissue, and in the form of the capsule and calyptra; the only distinctive characters of *Anodus* consisting in the minute denticulation of the leaves, in the less solid texture of the capsule, and in the total absence of a peristome. They rely chiefly on the latter character as affording a basis for its separation either as a genus or as a subgenus; the analogy being the same as that of *Hymenostomum* and *Gymnostomum* to *Weissia*, and of *Pottia* to *Desmatodon*. "If," say they, "a genus should contain only co-ordinate species, of which the principal organs are in the same degree of development, then the true *Gymnostoma* ought to be generically separated from those mosses which are furnished with a peristome; if, on the contrary, we admit into a genus an ascending series of forms, all the *Gymnostoma* may rank in the same genus with analogous forms possessed of a peristome. The latter mode is more sure than the other, because it cannot always be ascertained whether a peristome is really wanting in all circumstances, *e. g.* in *Encalypta vulgaris*, *Physcomitrium fasciculare*, and *Cinclidotus aquaticus*. These difficulties of classification are the necessary result of our present imperfect knowledge of all the connecting links between the various families and genera, which are often from that cause held together by very far-fetched analogies." Name from *ανευ*, *without*, and *οδους*, *tooth*.

51. *Anodus Donianus* Br. and Sch. (*Don's Bristle Moss.*) Tab. VII.)

Bryol. Eur. Monogr. p. 3. t. 1.

Gymnostomum Donianum *Eng. Bot.* t. 1582. *Hook. and Tayl. Bridel.*

Hab. On rocks, chiefly of sandstone, rare. Den of Dupplin, Perthshire, *G. Don.* Den of Airly, and at Norran Water, *T. Drummond.* On clay-slate in Glenshira, near Inverary, *Rev. C. Smith.* Near Todmorden, *Mr. Nowell.* Near York, *Mr. Spruce.*

Stems very short and slender, gregarious. Leaves lanceolato-subulate, almost setaceous, acute, crenulato-denticulate. Perichætial leaves shorter, rather blunt. Capsule small, turbinate, erect, wide-mouthed, especially when dry and empty, in which state the columella is exserted. Lid with a short beak. Calyptra dimidiate.

One of the smallest of mosses, distinguished from *Seligeria pusilla* and its allies by the absence of a peristome, and by its smaller size.

Subord. V. DICRANEÆ.

This group contains seven genera; viz. *Stylostegium*, *Blindia*, *Arctoa*, *Cynodontium*, *Dicranum*, *Leucobryum*, and *Ceratodon*. The first genus has no peristome. The other genera, except *Blindia*, have the teeth of the peristome more or less deeply cloven.

12. STYLOSTEGIUM.

Capsule roundish-pyriform, on a very short pedicel, almost hid in the leaves. *Peristome* none. *Annulus* none. *Lid* large, obliquely rostrate. *Calyptra* small, cucullate, scarcely covering the lid. *Columella* thick, falling away, in union with the lid. *Spores* rather small. *Vaginula* oblong.

Stems perennial, cæspitose, dichotomously branched. *Leaves* crowded, lanceolato-subulate, entire, suberect, rather rigid and glossy, not crisped when dry; the *nerve* strong and predominant in the upper portion of the leaf; *areolæ* oblong, larger towards the base; *perichætial leaves* sheathing, larger than the rest. *Inflorescence* monoicous, terminal; *barren flowers* gemmiform.

In habit and mode of growth this genus is nearly allied to *Blindia*, but has very little affinity with *Schistidium*, *Gymnostomum*, and *Anœctangium*, to one or other of which it has been referred by different authors.

Name from στυλος, *a column*, and στεγη, *covering* or *lid.*

52. *Stylostegium cæspiticium* Br. and Sch. (*minute-tufted Beardless Moss*); the only species. (Tab. XXXVIII.)

Bryol. Europ. fasc. 33—36. p. 3. t. 1.

Anœctangium cæspiticium *Schwaegr.* Suppl. t. 12.

Schistidium cæspiticium *Bridel.* *Nees and Hornsch.* Bryol. Germ. t. 8. f. 2.

Gymnostomum cæspiticium *Web. and Mohr.* *Hooker* in Eng. Flora, vol. 5. Suppl. Eng. Bot. t. 2778.

Blindia stylostegium *C. Müller*, Syn. Musc. i. 345.

Hab. In the crevices of alpine rocks. Summit of Ben Lawers. Fr. July.

Stems densely tufted, about ½ inch long, or more, flexuose, branched; branches fastigiate. Leaves crowded, suberect, or somewhat falcate and turned to one side, firm, rather glossy, ovate-lanceolate, subulate or acuminate. Perichætial leaves larger, with a sheathing oblong base, entire, nerve predominant. Fruitstalk scarcely longer than the obovate capsule, which is almost concealed by the perichætial leaves. Lid adhering to the columella (*fig. a.*), not soon falling away, rostrate.

This is not easily confounded with any other British moss. *Zygodon Lapponicus* differs from it in the striated capsule, and in the form and structure of the leaves.

13. BLINDIA.

Capsule roundish-subpyriform, of firm texture, subapophysate, erect, on a straight pedicel, turbinate when dry and empty. *Lid* large, obliquely rostrate. *Calyptra* at first 4—5–6 angular in the lower part, subsequently cloven on one side, and cucullate. *Annulus* none. *Peristome* single; *teeth* 16, equidistant, lanceolate, remotely barred, entire or variously perforated (cribrose), and sometimes cloven at the apex, slightly trabeculate on the inner side, deep red. *Spores* not large, smooth, reddish-brown. *Vaginula* oblong.

Stems cæspitose, dichotomously branched, producing innovations below the fertile apex, rooting at the base only, filiform, flexuose, solid, denuded of leaves when old. *Leaves* lanceolato-subulate, firm, and glossy, entire; *nerve* strong and predominant; *areolæ* minute, except at the base, subquadrate. *Inflorescence* dioicous, terminal; *barren flowers* gemmiform; *anthers* oblong, shorter than the paraphyses which accompany them.

Perennial, growing on moist alpine rocks.

Bruch and Schimper remark concerning this new genus, that it forms with *Stylostegium* a particular group in the family of the *Seligeriaceæ*, or, otherwise, it may be considered a separate family, nearly allied, and intermediate between the *Seligeriaceæ* and the *Dicranaceæ*. This is very much in accordance with our own views; but for the present we think it convenient to place this genus (where Bruch and Schimper have already put *Stylostegium*) with the *Dicranaceæ*. The peculiar structure of the young calyptra of *Blindia* is not noticed in the *Bryologia Europæa*, and we have not yet sufficiently compared the allied genera in order to determine this question. Name, in honour of Blind of Münster.

13.

Blindia acuta Br. and Sch. (*acute-leaved Blindia*). (TAB. XV.)

Bryol. Europ. Monogr. p. 3. t. 1.
Weissia acuta *Hedw.* St. Cr. t. 35. *Bridel. Hook. & Tayl.*
W. rupestris *Hedw.* Sp. M. t. 14.
Grimmia rupestris *Sprengel.*
Grimmia acuta *Turner. Smith*, Eng. Bot. t. 1644.
Bryum acutum *Dicks. Dill.* Musc. t. 47. f. 34.
Dicranum hyperboreum *Smith*, Fl. Brit. 1227. Eng. Bot. t. 2552. *Dicks.* fasc. 3. p. 9. ?

Hab. On moist alpine or subalpine rocks. Frequent on the Welsh and Scottish mountains. Near Todmorden, *Mr. John Nowell.*

Stems tufted, from ½ inch to 3 inches in height. Leaves crowded, subsecund, rather rigid, glossy, lanceolato-subulate, nerve thick and predominant. Perichætial leaves sheathing below. Capsule on a short reddish fruitstalk, scarcely rising above the leaves, roundish-pyriform, smooth, of firm texture. Teeth of the peristome deep red, erect when dry, converging when moist.

This has been confounded with *Arctoa fulvella*, but the capsule is never furrowed as in that moss. If we are right in referring *Dicranum hyperboreum* of Smith, as above, there is additional reason to doubt the validity of *Arctoa hyperborea* as a species.

The varieties of *Blinda acuta* are as follow: —

var. β. breviseta; stem shorter; capsule on a very short pedicel.
Weissia fastigiata *Nees and Hornsch.* Bryol. Germ. t. 35. f. 31.
Bryum immersum *Dicks.* Crypt. fasc. 4. p. 15. (partly).
var. γ. rupincola, with arcuate pedicels.
Weissia acuta *β. Wahlenb.* Fl. Lapp.
Grimmia rupincola *Web. and Mohr.*

Dickson's specimens of *Bryum immersum* consist partly of a species of *Campylopus* in a barren state.

14. ARCTOA *Br. and Sch.*

DICRANUM *Hook. and Tayl.*

Capsule erect, or inclined, shortly pedicellate, oval, or somewhat turbinate; when dry, furrowed and contracted below the mouth. *Lid* large, obliquely rostrate, crenulate in the margin. *Annulus* simple, subpersistent. *Calyptra* cuculate, inflated, large for the size of the capsule. *Peristome* single, large; *teeth* 16, equidistant, lanceolato-subulate, plane, either cloven into two unequal portions, or perforated and entire, rather rigid, deep red, with numerous transverse but scarcely prominent bars, more or less spreading when dry, very hygroscopic. *Spores* small, reddish-brown. *Vaginula* oblong.

Stems perennial, growing in alpine situations, on the ground or on rocks, densely cæspitose, erect or ascending, with innovations from below the apex, fastigiate. *Leaves* crowded, lanceolato-subulate, more or less falcato-secund, varying from green to reddish-brown, glossy, nerved, the nerve predominant in the upper portion of the leaf; *areolæ* oblong, larger and quadrate at the marginal base; *perichætial leaves* larger, sheathing in the lower part. *Inflorescence* monoicous, terminal.

There is a strong affinity between this genus and the falcate section of the genus *Dicranum*, but the form of the capsule and the configuration of the peristome are considered sufficiently different to warrant the separation.

Bruch and Schimper describe two species of this genus, but after much pains bestowed in the investigation of numerous specimens, we are unable to determine the existence of more than one British species, which is certainly *Bryum fulvellum* of Dickson, and yet has all the essential characters assigned to *Arctoa hyperborea*. Hence we conclude, that there is really but one species of this genus. Name, from αρκτος, *north;* this moss being found only in northern regions.

4. *Arctoa fulvella* Br. and Sch. (*brownish Fork-Moss*). (TAB. XXXIII.)

Arctoa fulvella and A. hyperborea *Br. and Sch.* Bryol. Europ. Monogr. p. 4—6. t. 1, 2.
Dicranum fulvellum *Smith*, Fl. Brit. p. 1209. Eng. Bot. t. 2268. *Grev.* Scot. Crypt. Fl. t. 188. *Hooker and Tayl. Bridel. C. Müller*, Syn. Musc.
Bryum fulvellum *Dicks.* Crypt. fasc. 4. t. 11. f. 1.
Grimmia Schisti *Smith*, Fl. Brit. Eng. Bot. t. 1952.

Hab. In the fissures of alpine rocks. Snowdon, N. Wales. Ben Nevis, Clova Mountains, &c., near the summit.

Fr. July.

Stems ½—2 inches in length, erect or decumbent, densely tufted. Leaves crowded, more or less secund, often falcate, lanceolato-subulate, or lanceolato-setaceous, rather firm, not crisped when dry, glossy, dull green, or frequently fulvous brown, often obscurely denticulate at the apex, the nerve rather strong and predominant. Perichætial leaves larger than the rest, sheathing below. Fruitstalk varying in length, sometimes not longer than the perichætial leaves. Capsule ovate, regular, or gibbous, when dry wide-mouthed, and marked with 8 furrows. Lid obliquely rostrate. Annulus large. Teeth of the peristome usually broad, cloven half way, occasionally trifid and perforated. Barren flowers inserted below the perichætial leaves, gemmiform.

This has sometimes been confounded with *Blindia acuta*, but differs essentially in the structure of the peristome, and in the furrowed capsule.

As already mentioned, we have in vain sought for some permanent and satisfactory distinction between the two supposed British species, but all the specimens we have seen agree with the description and figure of *Arctoa hyperborea*, having a decidedly striated or furrowed capsule, when dry, and showing the other characters ascribed to that species in contradistinction to *Arctoa fulvella*. Bruch and Schimper have been led to conclude that the moss figured in Greville's *Sert. Crypt. Flora* belongs to *A. hyperborea*, because the capsule is there described as "striated when moist and furrowed when dry, cyathiform, the orifice very large." The specimens figured in that work correspond exactly with our own. Dickson, the original authority for *Arctoa* (*Bryum*) *fulvella*, describes the capsule "lævis, demum striata, ore patulo," and Smith, in *Eng. Bot.*, in pointing out the difference between *Dicranum fulvellum* and *Grimmia acuta*, t. 1644. makes distinct mention of a specimen of the former from Mr. Dickson which has the capsule "longitudinally furrowed or ribbed." As to *Dicranum hyperboreum* of Smith, *Fl. Brit.*, and of Dickson, which we have referred with some doubt to *Blindia acuta*, it is probably different from *Bryum hyperboreum* Gunner, *Fl. Norveg.*, and Oeder, *Fl. Danica*, the capsule being described as smooth, and the figure in *Eng. Bot.* t. 2552. represents the fruitstalk three times the length of the capsule. Moreover, Smith never saw a specimen of Oeder's moss.

15. CYNODONTIUM *Br. and Sch.*

Didymodon *Hook. and Tayl.*

Capsule either obliquely subpyriform, or erect, ovate-oblong, and symmetrical, on an erect or subflexuous pedicel, smooth, its walls rather thin and loosely cellular. *Calyptra* cucullate, rather large. *Annulus* simple, breaking off piecemeal. *Operculum* obliquely rostrate. *Peristome* single, very irregular; *teeth* 16, lanceolate, confluent, and dilated at the base, sometimes cloven to the base, the segments either free or connected by bars, sometimes entire, with numerous transverse bars, plane, deep red, scarcely hygroscopic, converging when wet. *Spores* of medium size. *Vaginula* long, cylindrical.

Growing upon rocks. *Stems* perennial, tufted, branched in a fastigiate manner. *Leaves* spreading, variously curved, linear-lanceolate, margin remotely toothed, reflexed in the lower part of the leaf, minutely granulose on both surfaces; *areolæ* quadrate, larger near the base. *Inflorescence* monoicous; *barren flower* gemmiform; *antheridia* cylindrical, incurved, with longer paraphyses; *fertile flower* 3-leaved, at length forming a proper perichætium.

An ambiguous genus, intermediate between *Weissieæ* and *Dicranum*. In habit, in the texture of the leaves, and in the form of the capsule, allied to *Weissia serrulata*, and in the mode of growth, form of the leaves and calyptra, allied to *Dicranum polycarpum*, while the peristome connects it with the heterogeneous genus *Didymodon*. Hence the true place of *Cynodontium* is difficult to determine. Meanwhile it is considered best to rank it with the *Dicraneæ*. Name from κυων, κυνος, *a dog*, and οδων, *tooth*.

5. *Cynodontium Bruntoni* Br. and Sch. (*Brunton's Fork-Moss*). (Tab. XXXIV.)

Bryol. Europ. Monogr. p. 3. t. 1.

Dicranum Bruntoni *Smith*, Eng. Bot. t. 2509. *C. Müller*, Syn. Musc.

Didymodon Bruntoni *Arnott*, Disp. Musc. p. 36. *Hook. and Tayl.* Musc. Brit. ed. 2.

Didymodon obscurum *Kaulfuss* in Sturm. Deutsch. Fl. c. icone. *Schwaegr.* Suppl. t. 125. *Funck*, Deutsch. Moose. *Grev.* Scot. Crypt. Fl. t. 193.

Grimmia cirrata *Smith*, Fl. Brit. 1189. Eng. Bot. t. 2356. (*Dickson's specimen in Herb. Turner.*)

Dicranum polycarpum *Hook and Tayl.* Musc. Brit. ed. 1. *Hook.* Fl. Scot. *Hobson*, Brit. Mosses. *Drummond*, Musc. Scott.

Hab. Rocks in subalpine or hilly districts, not uncommon.

This moss bears some resemblance to *Weissia cirrata* in the foliage, but the capsule is more turgid, shorter, and generally obliquely pyriform, or obovate, not symmetrical, and has a very different peristome. (See the description of the genus.) Leaves linear-lanceolate, keeled, margin reflexed, often minutely denticulate, spreading and curved, when dry incurved and twisted, the nerve ceasing at or near the apex of the leaf; perichætial leaves sheathing below. Peristome bright red, fragile, deciduous. The smooth pyriform capsule and shorter leaves distinguish this moss at first sight from *Dicranum polycarpum*, which it otherwise much resembles.

16. DICRANUM *Hedw.*

Capsules either aggregate or single in the same perichætium, erect or cernuous, regular, gibbous or curved, ovate, oval, oblong or cylindrical, the neck or apophysis sometimes tapering gradually into the erect fruitstalk, sometimes tumid, or in some cases strumose, smooth, either uniformly coloured or marked with coloured striæ, the walls thin and membranous, coriaceous, or solid. *Calyptra* cucullate, with a long beak, reaching halfway down the capsule, or more, generally falling away along with the operculum. *Lid* conical at the base, with a slender oblique beak varying in length. *Annulus* of two or three rows of cellules, seldom absent. *Peristome* single; *teeth* 16, equidistant, confluent at the base, incurved and somewhat converging both in a wet and in a dry state, longer than the diameter of the capsule, lanceolate, cloven half way or more into two unequal portions, the medial line being continued to the base, with occasional perforations, marked with transverse bars prominent on the inner side of the tooth, and lined externally with a somewhat rigid membrane, colour red or orange. *Spores* rather small, reddish brown.

Perennial plants, growing on rocks, or on the ground, sometimes on the trunks of trees. *Stems* varying in size from a few lines to several inches, growing in tufts, more or less dense and extensive, either loosely cohering or matted together by the numerous radicles clothing all parts of the stem, which increases by means of fastigiate innovations from below the flowering summit.

Leaves in 5 or 8 rows, more or less crowded, spreading or secund, often falcato-secund, when dry straight or crisped, broadly lanceolate, linear-lanceolate, or lanceolato-subulate, entire, or serrated near the apex, smooth, or papillose on the surface, the *nerve* semi-cylindrical, either excurrent or ceasing at or below the apex. *Reticulation* variable, usually small, dot-like, or roundish in the narrower part of the leaf, elongated, narrow, and often wavy lower down, at the marginal base considerably enlarged, quadrate, and more or less deeply coloured. *Inflorescence* (except in one androgynous species) monoicous or dioicous, terminal. *Perigonia* (barren-flowers) gemmiform, or capituliform, with 3 to 9 leaves surrounding the oblong, shortly pedicellate antheridia. *Paraphyses* yellowish, filiform. *Fertile flower* gemmiform, the involucre at length changed into a perichætium. *Archegonia* with long styles, accompanied by shorter paraphyses. *Perichætium* more or less closely sheathing, its leaves longer, wider, and of thinner texture than the stem leaves, with a narrower fainter nerve.

This extensive genus (named from δικρανον, a *forked instrument*) presents so many diversities in the mode of growth, in size, in the form and direction and texture of the leaves, in the position of the flowers, and in the form and direction of the capsule, that at first sight a subdivision into two or more genera would seem both easy and requisite. But we agree with Bruch and Schimper in the conclusion that the more the species are studied as a whole, they will be found too closely related to admit of dismemberment.

The smaller species are not much unlike the *Weissiæ*, while the larger ones approach in some cases the *Trichostoma* and *Cynodontium.* The genus contains some species scarcely surpassed in size by any of the acrocarpous division of the order.

In several of the larger species of *Dicranum* which have the stem covered with a dense layer of radical fibres, the barren-flowered plants appear to be replaced by minute buds, nestling among the fibres; and up to the present time this is all that is known of the barren inflorescence of certain species; but in *D. scoparium* the inflorescence may sometimes be traced from these radicular gemmæ up to the perfect development of detached barren-flowered plants. A somewhat analogous process is observable also in a few species of *Hypnum.*

We follow the admirable arrangement and subdivision of the genus given in the *Bryologia Europæa.*

Sect. I. *Polycarpa.*

Growing in soft tufts, two inches high, repeatedly forked; *branches* fastigiate, and rooting in all parts of the stem. *Leaves* spreading every way, flexuose, crisped when dry, linear-lanceolate, papillose on both sides, crenulate in the margin, *nerve* ceasing below the apex. *Inflorescence* monoicous. *Capsule* ovate, or oval, (its *neck* symmetrical or strumose,) striated. *Calyptra* whitish, somewhat inflated. *Lid* with a beak shorter than the capsule.—*D. gracilescens* (not found in Britain). *D. polycarpum.*

Sect. II. *Virentia.*

Cæspitose. *Stems* rooting in all parts, twice or thrice dichotomous, usually decumbent, densely and uniformly leafy. *Leaves* spreading and squarrose, slightly crisped, lanceolate, smooth, opaque, entire, or subdenticulate at the apex only; *nerve* slightly excurrent, monoicous. *Capsule* cernuous, gibbous, and slightly curved, smooth, the neck decidedly strumose, walls of the capsule composed of minute irregular roundish-hexagonal cellules. —*D. virens.*

Sect. III. *Squarrosa.*

Loosely tufted, rooting in the axillæ of the lower leaves. *Leaves* squarrose, widely lanceolate, entire or denticulate at the apex; *nerve* ceasing below the apex. Dioicous. *Barren fl.* capituliform. *Capsule* cernuous, smooth; *neck* short, tumid, but not strumose.

a. With papillose denticulate leaves. *D. pellucidum.*
b. With smooth entire leaves. *D. squarrosum.*

Sect. IV. *Crispa.*

Subcæspitose. *Stems* short, rooting in the lower part. *Leaves* subsquarrose, crisped when dry, sheathing at the base, lanceolate or subulate above, smooth and somewhat glossy, more or less denticulate or serrulate at the apex; *nerve* either excurrent, or ceasing near the apex. *Inflorescence* monoicous or dioicous. *Barren fl.* capituliform. *Capsule* cernuous, smooth or obscurely striated, with or without a strumose neck.

a. Dioicous. *D. Schreberi.*
b. Monoicous. *D. Grevilleanum. D. crispum.*

Sect. V. *Rufescentia.*

Stems short, gregarious, scarcely cæspitose. *Leaves* more or less secund, lanceolate, opaque, entire or obscurely dentate; *cellules* oblong, rather large. Dioicous. *Capsule* erect or somewhat inclined, without striæ. *Annulus* none. *Lid* large, with a short beak. *Peristome* large in proportion to the size of the plant.—*D. varium. D. rufescens.*

Sect. VI. *Heteromalla.*

Cæspitose, about an inch high. *Leaves* secund, glossy, lanceolato-subulate, entire; *nerve* predominant above, flattened. Dioicous. *Capsule* cernuous, or suberect, uniformly coloured or striated; *neck* symmetrical or strumose. *Lid* conical at the base, with a long beak.—*D. cerviculatum. D. subulatum. D. curvatum* (not British). *D. heteromallum.*

Sect. VII. *Falcata.*

Densely tufted. *Stem* taller, repeatedly dichotomous and fastigiate, usually decumbent at the base, with few or no radicles. *Leaves* secund, or falcato-secund, lanceolato-subulate, entire, or denticulate, glossy; *nerve* predominant above, as in the last section; cellules of the marginal base much enlarged and coloured. Monoicous. *Capsule* cernuous (*neck* strumose or ventricose), uniformly coloured or striated. *Lid* with a long beak.—*D. Blyttii. D. Starkii. D. falcatum.*

Sect. VIII. *Orthocarpa.*

Densely cæspitose. *Stems* one or more inches high, twice or thrice dichotomous, everywhere coated with radicular fibres. *Leaves* secund, rarely directed to all sides, lanceolato-subulate, smooth, glossy; *nerve* excurrent; *cellules* narrow, much enlarged, quadrate, and reddish-brown at the marginal base. Monoicous. *Capsule* erect, cylindrical; *neck* longer than usual, symmetrical. *Lid* conical at the base. *Peristome* small.—*D. strictum. D. montanum. D. flagellare. D. interruptum. D. Scottianum. D. Sauteri. D. longifolium.* Of these only one species (*D. Scottianum*) is found in Britain.

Sect. IX. *Scoparia.*

Growing in broad and tall patches, loose, or densely matted together. *Stems* tall, handsome, everywhere covered with proliferous radicular fibres. *Leaves* long, spreading every way, or secund, lanceolato-subulate, glossy, denticulate at the apex, loosely cellular, with quadrate areolæ at the base; *nerve* with or without dorsal lamellæ. Dioicous, or quasi-monoicous. *Perichætium* cylindrical, enclosing one fruitstalk. *Capsule* cernuous, bent. *Lid* with a long beak.—*D. scoparium. D. elongatum* (not found in Britain). *D. fuscescens* Turn. *D. Mühlenbeckii* (not British). *D. palustre.*

Sect. X. *Spuria.*

Cæspitose. *Stems* tall, everywhere beset with radicular fibres. *Leaves* spreading every way, glossy, ovate-lanceolate, transversely undulated; *nerve* flattish, rugose at the back near the apex; *cellules* as in the section *Scoparia*. *Barren flowers* not observed (dioicous ?). *Perichætium* closely sheathing, with one fruitstalk. *Capsule* cernuous, curved. *Peristome* rather small. — *D. Schraderi. D. spurium.*

Sect. XI. *Undulata.*

The tallest and most showy of the genus, growing in large patches. *Stems* everywhere beset with whitish radicular proliferous fibres. *Leaves* large, glossy, spreading every way, or secund, lanceolate below, linear-subulate above, transversely undulated, or even; *nerve* flattish, with lamellæ at the back. *Perichætium* long, containing several fruitstalks. In other respects as in the two previous sections. — *D. undulatum. D. robustum. D. majus* (of these only *D. majus* is found in Britain).

Since the publication of the above in *Bryol. Eur.*, C. Müller (in *Synops. Musc.*) has removed the species of Sects. II., III., IV., V., and VI., into a separate group, *Leptotrichaceæ*, and into the genus *Angstrœmia*, said to be distinguished from *Dicranum* by the cucullate calyptra, and by the absence of the enlarged diaphanous cellules (cellulæ alares) at the marginal base of the leaf, which characterise the *Dicranaceæ*.

SECT. I. POLYCARPA.

1. *Dicranum polycarpum* Ehrh. (*many-fruited Fork-Moss*); stems elongated; leaves more or less crowded, spreading, flexuose or recurved, linear-lanceolate or lanceolato-subulate, keeled, margin recurved, scarcely papillose, serrulate at the apex; capsule erect and equal, or cernuous, gibbous, and strumose at the base, striated; lid rostrate. (TAB. XVIII.)

Dicranum polycarpum *Ehrh.* Decad. *Smith*, Fl. Brit. Eng. Bot. t. 2269. *Mougeot and Nestler*, n. 414. *Schwaegr.* Suppl. *Hook. and Tayl.* *Br. and Sch.* Bryol. Europ. Monogr. p. 14. t. 2. *C. Müller*, Syn. Musc. 2. 591.
D. montanum *Eng. Bot.* t. 2279.
D. flagellare *Eng. Bot.* t. 1977. (right-hand figure, from *Mr. Dickson.*)
Fissidens polycarpus *Hedw.* St. Cr. t. 31.
Oncophorus polycarpus *Brid.* Bryol. Univ. i. 397.

var. β. strumiferum; capsule unequal, strumose at the base.
D. strumiferum *Web. and Mohr.* *Schwaegr.* *Hook. and Tayl.* (TAB. XVII.) *C. Müller*, Syn. Musc. ii. 592.
Oncophorus strumifer *Bridel.*

Hab. Alpine rocks, not frequent. Cader Idris, *Mr. Ralfs.* Clova Mountains. Ben High, *G. Don.* Bushiel Dene, Berwickshire, *Mr. James Hardy.* Rocks in Humbledon Dene, above Wooler, *Dr. G. Johnston.* var. β. Glen Phee, Clova.
Fr. July, August.

Stems cæspitose, about 1 inch high, more or less. Leaves variously bent, often recurved, somewhat twisted when dry, gradually enlarged towards the summit of the stem, somewhat papillose or granular on both sides, margin reflexed, denticulate at the apex and at the base, nerve subexcurrent. Capsule on a straight fruitstalk, ovate-oblong, erect, symmetrical in the typical form of the species, the neck slightly tumid; unequal, inclined and strumose at the base in the var. β., striated, especially when dry. Calyptra reaching nearly to the base of the capsule. Lid obliquely rostrate, shorter than the capsule. Annulus distinct. Peristome variable; teeth deeply cloven or variously perforated, reddish brown. Barren flower at the base of the perichætium.

D. gracilescens Web. and Mohr, frequently confounded with this species, differs in having more slender stems, and shorter, softer, more papillose leaves, which have the margins plane not reflexed in the upper half, the capsule shorter, more regular, and never strumose.

D. alpestre Wahlenb. is considered by Bruch and Schimper to be only a small state of *D. gracilescens*, on the authority of specimens from Wahlenberg. In the Hookerian *Herbarium*, however, there is an authentic specimen from Wahlenberg which is scarcely distinguishable in aspect from *Rhabdoweissia Schisti*, differing only in the peristome, which is truly that of *Dicranum*, and in the obtuse leaves. It appears to be a distinct species.

D. polycarpum much resembles *Cynodontium Bruntoni*, but is easily known by the striated capsule.

SECT. II. VIRENTIA. *Angstrœmia* C. Müller.

57. 2. *Dicranum virens* Hedw. (*green spur-fruited Fork-Moss*); stems elongated, loosely tufted, twice or thrice dichotomously branched; leaves spreading, erect, and slightly sheathing at the base, lanceolate, incurved when dry, smooth, opaque, their margins recurved; capsule cernuous, smooth, oblong, curved, distinctly strumose; lid rostrate. (TAB. XVII.)

D. virens *Hedw.* St. Cr. t. 32. *Schwaegr. Turn. Smith,* Eng. Bot. t. 1462. *Web. and Mohr. Hook. and Tayl. Br. and Sch.* Monogr. p. 15. t. 3, 3*.
Oncophorus virens *Brid.*
Angstrœmia virens *C. Müller,* Syn. Musc. ii. 609.

Hab. On moist alpine rocks, abundant on Ben Lawers, &c.
Fr. June, July.

Stems often 3 inches high, with scattered radicular fibres. Leaves ovate-lanceolate, erect and slightly sheathing at the base, linear-lanceolate and spreading in the upper half, incurved but not crisped when dry, reflexed in the margin, entire or subdenticulate at the apex; nerve thicker than in the last species, subexcurrent. Perichætial leaves larger than the rest, and more sheathing. Capsule cernuous, curved, oblong, with a distinct struma at the base, reddish-brown, smooth without striæ, slightly constricted below the mouth when dry and empty. More robust than the *D. polycarpum*, the leaves firmer, broader below, glossy, much less crisped when dry, with a thicker nerve. It varies, according to Bruch and Schimper, as follows: —

var. β. Wahlenbergii; leaves flexuose and spreading, sheathing at the base, much attenuated above, narrower and longer, much contorted when dry, yellowish; capsule short, with a very prominent struma.
Oncophorus Wahlenbergii *Bridel*, Bryol. Univ. i. 400.
Dicranum virens *Wahlenb.* Fl. Lapp. p. 338. (ex parte).
D. Richardsoni *Hook.* in Drummond, Musc. Amer. No. 106.
Angstrœmia Wahlenbergii *C. Müller*, Syn. Musc. ii. 610.

var. γ. serratum; loosely tufted; stems taller, sparingly branched; leaves recurved, or spreading and flexuous from a sheathing base, crisped when dry, coarsely serrated.

var. δ. compactum; densely tufted; stem shorter, more slender; leaves shorter, lanceolate from an ovate base, entire or scarcely toothed at the apex, lower ones lurid; capsule on a shorter pedicel, gibbous.
D. Homanni *Boeck.* in Hartm. Skandinav. Flor. ed. 4. p. 384.

var. ε. gracilescens, with narrower leaves and smaller capsules.
D. microcarpum *Hook.* in Drummond. Musc. Am. No. 105. "strongly resembles *D. virens var. compactum* of Funk." (See remarks of Bruch and Schimper in Lond. Journ. Bot. Dec. 1843.)

The var. β. appears to us a distinct species belonging to the section *Crispa*, having the leaves suddenly dilated and sheathing at the base, the upper part much longer and more attenuated than in *D. virens*, distinctly serrulate above, margin not reflexed, the nerve thicker and much more prominent at the back. Var. ε. may indeed be only a slender compact state of *D. virens*, but the specimens collected in North America by Drummond with the leaves more suddenly dilated and sheathing below, the capsules furrowed when dry and empty, and the walls of thinner texture than in the typical form, belong to a probably different species, as given in the Synopsis of C. Müller.

SECT. III. SQUARROSA.

3. *Dicranum pellucidum* Hedw. (*transparent Fork-Moss*); dioicous; stems loosely tufted; leaves squarrose, variously bent, lanceolate from a slightly sheathing base, rather obtuse, entire, serrated or crenulate at the apex, papillose on both sides; capsule ovate, subcernuous; lid rostrate. (TAB. XVII.)
D. pellucidum *Hedw.* Sp. M. *Schwaegr.* Suppl. t. 48. *Web. and Mohr. Swartz. Turner. Smith*, Eng. Bot. t. 1346. *Röhl. Bridel. Hook. and Tayl. Br. and Sch.* Monogr. p. 16. t. 4, 4*.
Bryum pellucidum *Linn. Dill.* Musc. t. 46. f. 23.
Angstrœmia pellucida *C. Müller*, Syn. Musc. ii. 606.

var. β. fagimontanum; stem short, with slender branches; leaves shorter.

var. γ. serratum; leaves crenato-serrate; capsule oval, or oblong, erect, or suboblique; lid with a slender beak.

D. flavescens *Eng. Bot.* t. 2263. *Smith,* Fl. Brit. *Hook. and Tayl.* (TAB. XVII.) Musc. Brit. p. 98. (excluding the synonyms of Web. and Mohr, Schwaegrichen, and Funk.)

Bryum flavescens *Dicks.*

Bryum lineare *Dicks.* Crypt. fasc. 3. p. 6. t. 8. f. 2.

Hab. On wet rocks and stones, in shady rivulets, &c., especially near the spray of cascades. Fr. Oct. Nov.

Growing in patches of a light-green colour, about 1 or 2 inches high. Leaves lanceolate, squarrose and straggling, somewhat sheathing below, slightly undulated in the margin, twisted or crisped when dry, keeled, usually with plane margins, entire or crenulate at the apex, distinctly papillose at the back, especially along the nerve, areolæ dot-like, nerve ceasing below the apex. Capsule on a rather thick wavy pale fruitstalk, cernuous, or in the var. γ. quite erect, roundish, shortly ovate or oblong, destitute of a struma, its walls thick and firm, reddish-brown, at length blackish. Teeth of the peristome variable, sometimes scarcely cloven, sometimes with prominent bars. Lid large, conical at the base, with a longer or shorter oblique beak. Barren flowers capituliform, terminal, on a separate individual.

The var. γ. has longer and narrower leaves, sometimes only half as wide at the base as in *D. pellucidum α.*, gradually tapering to a more acute point, and distinctly serrated; in some specimens not evidently papillose, and the teeth of the peristome narrower and longer. We have observed it growing in company with the typical form, but not intermixed; and although we confess that it is not easy to define the limits between the two forms, we are scarcely convinced as yet that they are only varieties of one species. *D. gracilescens* Web. and Mohr, is an alpine species, perfectly distinct from *D. flavescens.*

D. pellucidum has a remarkable aspect, and, on account of its short roundish capsule, seems scarcely to belong to the genus. *Tridontium Tasmanicum* Hook. fil. in *Hook. Ic. Plant.* t. 248. belongs to this genus, and is a closely allied species. It is no uncommon circumstance to find the teeth trifid in *Dicranum.* This occurs even in the smaller species, e. g. *D. cerviculatum.*

59. 4. *Dicranum squarrosum* Schrad. (*drooping-leaved Fork-Moss*); dioicous; stems elongated, dichotomous; leaves squarrose and recurved, lanceolate from a broad sheathing base, obtuse, concave, entire, nerve narrow, ceasing below the apex; capsule cernuous, ovate-oblong, scarcely strumose at the base; lid with a short beak. (TAB. XVII.)

D. squarrosum *Schrad.* Journ. *Schwaegr.* Suppl. t. 47. *Turn. Smith,* Eng. Bot. t. 2004. *Web. and Mohr. Hooker and Tayl. Br. and Sch.* Monogr. p. 17. t. 5.

Angstrœmia squarrosa *C. Müller,* Syn. Musc. i. 438.

Bryum palustre *Dicks. Dill.* Musc. t. 46. f. 24.

Hab. In wet places among mountains, not common in fruit. Fr. Aug. Sept.

Stems 1—3 inches long, forming loose bright-green patches. Leaves recurved, widely spreading, somewhat undulated, entire, margins plane, not papillose, scarcely altered or crisped when dry. Capsule on a thick reddish fruitstalk, its walls thick and firm, smooth when dry; the neck sometimes obscurely strumose, slightly constricted below the mouth. Annulus wanting. Barren-flowered plants with capituliform flowers.

The most squarrose of the British *Dicrana*. It may be known from *D. pellucidum*, its nearest ally, by the broader, recurved, entire, not papillose leaves, scarcely changed when dry. Its aspect is peculiar, and in a barren state the stems are often 6 inches long.

SECT. IV. CRISPA.

5. *Dicranum Schreberi* Hedw. (*Schreber's Fork-Moss*); dioicous; stems gregarious, subcæspitose, sparingly branched; leaves widely spreading from a broad sheathing base, suddenly lanceolato-subulate, carinate, subflexuous, margin denticulate; capsule ovate-oblong, cernuous; annulus none; lid shortly rostrate. (TAB. XXXIX.)

D. Schreberi *Hedw.* Sp. M. t. 33. *Bridel. Web. and Mohr. Swartz*, Musc. Suec. t. 2. *Br. and Sch.* Monogr. p. 18. t. 6.

D. recognitum *Röhl.* Bryum crispum *Schreb.*

Angstrœmia Schreberi *C. Müller*, Syn. Musc. 1. 438.

Hab. On clayey or sandy soil by rivulets or ditches, &c., rare. Near Irlam, Lancashire, *W. Wilson.* Cheshire. Near Glasgow, *Mr. G. J. Lyon.* F. Oct. Nov.

Stems ½—1 inch long, or more, forming loose light-green patches. Leaves suddenly contracted from a broad sheathing base, the upper portion narrowly lanceolate, wide-spreading and flexuose, somewhat crisped when dry, denticulate in the margin near the apex, nerve ceasing below the point; perichætial leaves larger than the rest. Capsule cernuous or suberect, shortly ovate or oblong, regular or slightly curved, smooth, reddish-brown, when dry somewhat contracted below the mouth. Lid large, conical at the base, shortly rostrate, about as long as the capsule. Barren flowers terminal on separate individuals.

This species is a miniature resemblance of the preceding species, with narrower leaves, more suddenly dilated and sheathing below. It differs from the following in the inflorescence, and in the shorter lid.

6. *Dicranum Grevilleanum* Br. and Sch. (*Greville's Fork-Moss*); monoicous; leaves from a wide sheathing base, suddenly lanceolato-subulate, wide-spreading and wavy, entire; capsule cernuous, ovate, substriated, substrumose; lid with a long beak. (TAB. XXXIII.)

Br. and Sch. Bryol. Europ. Monogr. p. 19. t. 7.

D. Schreberianum *Hook. and Tayl.* Musc. Brit. ed. 2.

p. 95. Suppl. Tab. 3. *Greville*, Scot. Cr. Fl. t. 116. *Hook.* in Drummond Musc. Americ. No. 97.
D. Schreberi var. Grevilleanum *Bridel*, Bryol. Univ.
Angstrœmia Grevilleana *C. Müller*, Syn. Musc. i. 439.

Hab. Upon the ground in an old neglected road in Glen Tilt, at the foot of Ben-y-Gloe, on a clayey soil: *Greville, Arnott, and Hooker*, 1823. Not since observed in any part of the British Isles. Fr. Aug. Sept.

Very like the preceding species, but differs thus: — Leaves longer and narrower, entire, with narrower cellules and broader predominant nerve; capsule somewhat striated, slightly strumose at the base; lid longer than the capsule, with a longer beak; inflorescence monoicous; growing in alpine situations where the true *D. Schreberi* is never found. It occurs in Switzerland, Italy, Germany, Sweden, and in North America.

62. 7. *Dicranum crispum* Hedw. (*curl-leaved Fork-moss*); monoicous; stems gregarious, short; leaves subulate from a wide sheathing base, widely spreading and flexuose, crisped when dry; capsule erect, oval or obovate, striated, lid subulate. (Tab. XVII.)

D. crispum *Hedw.* St. Cr. t. 33. *Swartz. Turner. Smith*, Eng. Bot. t. 1151. *Schwaegr. Web. and Mohr. Bridel. Hook. and Tayl. Br. and Sch.* Bryol. Europ. Monogr. p. 20. t. 8.
Angstrœmia crispia *C. Müller*, Syn. Musc. i. 439.

Hab. On moist banks in sandy soil, not common. Fr. Oct. Nov.

Growing in incoherent patches of a pale green colour. Stems short, scarcely branched, not ½ inch high. Leaves not much crowded, widely spreading, subulate, or almost setaceous, wavy, with a suddenly dilated sheathing base, somewhat glossy, minutely denticulate, the nerve predominant above, crisped when dry. Capsule erect on a reddish fruitstalk about ½ inch in length, of regular form, not strumose, furrowed when dry, oval or ovate-oblong. Annulus present. Lid conical at the base, with an oblique awl-shaped beak.

This is readily distinguished from its allies by the very narrow crisped leaves, and erect symmetrical striated capsule. In the foliage it has some resemblance to *Ceratodon cylindricus*. *Dicranum curvatum* Hedw., a species not yet found in Britain, has the capsule somewhat irregular, and the leaves falcato-secund.

Sect. V. Rufescentia.

63. 8. *Dicranum varium* Hedw. (*variable Fork-Moss*); dioicous; stems cæspitose, short, sparingly branched; leaves erecto-patent or secund, lanceolate, carinate, entire, scarcely toothed at the apex, margin reflexed, nerve subexcurrent, perichætial leaves scarcely sheathing; capsule oblique, rarely suberect, ovate or

oblong, regular or incurved; lid large, shortly rostrate. (TAB. XVII.)

D. varium *Hedw.* St. Cr. t. 34. *Turner. Smith,* Eng. Bot. t. 1215. *Web. and Mohr. Bridel. Schwaegr. Br. and Sch.* Byrol. Eur. Monogr. p. 21. t. 10, 11.
D. varium *a* viride *Hook. and Tayl.*
D. rigidulum *Swartz. Hedw.* Sp. M. t. 32. *Schwaegr. Smith,* Eng. Bot. t. 1439. *Bridel.*
Angstrœmia varia *C. Müller,* Syn. Musc. i. 435.

var. β. tenuifolium; leaves narrower, obscurely nerved.
D. subulatum *Eng. Bot.* t. 1273.

var. γ. tenellum; stem slender, scarcely branched, ascending; leaves falcato-secund, loosely cellular, remotely denticulate.

var. δ. callistomum; stem branched; leaves crowded, erecto-patent, scarcely secund; capsule shortly pedicellate, erect, small, truncato-obovate, lid broadly conical at the base, almost as long as the capsule.
D. callistomum *Dickson,* Crypt. fasc. 3. 5. t. 7. f. 10. *Smith. Bridel.*

Hab. On moist banks, &c., common. Fr. Nov. Dec.

Growing in loosely aggregate patches of a rufous green colour. Stems scarcely ½ inch long. Leaves lanceolate-tapering, suberect, more or less turned to one side, erect and straight when dry, the upper part carinate, with recurved margins, entire, or slightly toothed at the apex; perichætial leaves scarcely different from the rest. Capsule varying from ovate to oblong, and more or less oblique and incurved, slightly tumid at the base, smooth, its walls thick. Fruitstalk twisted to the right hand. Lid large, with a short beak. Annulus wanting. Peristome large, deep red, the teeth converging, deeply cloven. Barren-flowered plants more slender than the fertile ones.

This species varies much according to soil and locality: var. γ. in habit, in the shape and texture of the leaves, approaches to *D. rufescens,* but has the capsule, lid, and peristome as in the typical form of *D. varium;* var. δ. is believed to be a form dependent on the luxuriant growth of the stem and innovations, and, though not of uncommon occurrence, is scarcely to be regarded as a constant variety. This is one of the commonest species of the genus.

9. *Dicranum rufescens* Turn. (*reddish Fork-Moss*); dioicous; stems gregarious, short, scarcely branched, suberect; leaves lax, secund, reddish, linear-lanceolate, margins plane, obscurely toothed, loosely reticulated; capsule erect, equal, ovate or obovate, slightly tumid at the base; lid conico-rostellate. (TAB. XVII.)

D. rufescens. *Turn.* Musc. Hib. p. 66. *Smith,* Eng. Bot. t. 1216. *Bridel. Bruch and Sch.* Bryol. Europ. Monogr. p. 22. t. 12.
D. varium β. rufescens *Hook. and Tayl.* (TAB. XVII. middle figure.)

Angstrœmia rufescens *C. Müller*, Syn. Musc. i. 436.
Bryum rufescens *Dicks.* *Dill.* Musc. t. 50. f. 59.

Hab. On moist banks, chiefly in a sandy soil, not rare.
Fr. Oct. Nov.

Similar in habit to the last, but known at sight by the pale reddish hue of the whole plant. Stems bright red. Leaves almost pellucid, loosely cellular, not at all reflexed in the margin, which is somewhat dentate. Capsule erect, smooth, ovate, truncate, reddish, with a short neck. Lid large, with a short beak. Fruitstalk twisted to the left. Teeth of the peristome more closely barred than in the preceding species.

If due attention be paid to the above characters, this species cannot be confounded with *D. varium*, and it is a more elegant moss.

SECT. VI. HETEROMALLA. *Angstrœmia* C. Müller.

65.

10. *Dicranum cerviculatum* Hedw. (*spur-necked Fork-Moss*); dioicous; stems cæspitose, sparingly branched; leaves lanceolato-subulate, spreading and flexuose from a broad semi-amplexicaul base, subsecund, entire, glossy, the nerve predominant; capsule cernuous, ovate, gibbous, distinctly strumose at the base; lid obliquely rostrate. (TAB. XVI.)

D. cerviculatum *Hedw.* St. Cr. t. 37. *Turner.* *Swartz.* *Web. and Mohr.* *Smith*, Eng. Bot. t. 1661. *Schwaegr.* *Hook. and Tayl.* *Br. and Sch.* Monogr. p. 22. t. 9.
D. flavidum *Schwaegr.* Suppl. t. 45.
Oncophorus cerviculatus and flavidus *Bridel.*
Angstrœmia cerviculata *C. Müller*, Syn. Musc. i. 430.

var. β. pusillum; stem shorter, simple; leaves suberect, smaller; capsule smaller and less gibbous.

D. pusillum *Hedw.* St. Cr. t. 29. *Smith*, Eng. Bot. t. 2491. *Schwaegr.* *Bridel.*
D. uncinatum *Smith*, Eng. Bot. t. 2261. (as to Swartz's specimens, not Dickson's).
D. sudeticum *Schwaegr.* Suppl. t. 45. (if not D. subulatum?).
Bryum uncinatum, cerviculatum, and parvulum *Dicks.*

Hab. On banks, &c., in a turfy or sandy soil, frequent.
Fr. June, July.

Growing in dense extensive patches of a yellowish-green colour. Stems not ½ inch high. Leaves rather lax, widely spreading, subsecund, flexuose, slightly crisped when dry, almost setaceous above, dilated below, glossy, entire, the nerve predominant above. Fruitstalk about ½ inch long, slender, yellowish. Capsule roundish-ovate, gibbous, sharply strumose, obscurely furrowed when dry and empty. Lid with a long subulate beak. An imperfect annulus is present.

This species differs from the allied species of this section in its smaller size, spreading and somewhat straggling flexuose leaves, and roundish capsule which is distinctly and sharply strumose at the base. The pale yellowish hue of the plants is also remarkable. It is one of the commonest species in black turfy soil.

11. *Dicranum subulatum* Hedw. (*awl-leaved Fork-Moss*); dioicous; stems loosely tufted; leaves secund, more or less falcate, subulato-setaceous from an elliptical or lanceolate base, entire, the nerve predominant; capsule cernuous, ovate, gibbous, striated when dry; lid with a long beak. (TAB. XVIII.)

D. subulatum *Hedw.* Sp. M. t. 34. *Turner? Smith? Schwaegr. Bridel. Hook. and Tayl. Br. and Sch.* Monogr. p. 24. t. 13.
Angstrœmia subulata *C. Müller*, Syn. Musc. i. 433.
Bryum inclinatum *Dicks.* Cr. 3. 9. (in Herb. Turner).

Hab. Moist shady banks, in a micaceous or sandy soil. Not unfrequent in the Highland mountains. Welsh mountains. Near Manchester and Stayley Bridge. Near Over, Cheshire. Fr. Sept. Oct.

Growing in silky green patches, from ½—1 inch in height. Leaves secund, or falcato-secund, oblong-lanceolate at the base, thence gradually attenuated and almost setaceous, entire, glossy, the nerve predominant in the upper part of the leaf. Fruitstalk red, varying in length. Capsule obliquely cernuous, not strumose, striated when dry and empty, reddish brown. Annulus composed of a double row of cellules.

This species is very easily distinguished from *D. heteromallum* by the red fruitstalk, and smaller regularly striated capsule, as also by the more slender habit. *D. curvatum* Hedw., a species not known as British, has the capsule more erect, and nearly symmetrical, almost cylindrical; but it is difficult to decide whether it has any better claim to stand as a species than *D. flavescens*. *D. subulatum* of *Eng. Bot.* t. 1273. is *D. varium.*

12. *Dicranum heteromallum* Hedw. (*silky-leaved Fork-Moss*); dioicous; stems cæspitose, simple, or branched; leaves crowded, secund, lanceolato-setaceous, slightly dentate at the apex, silky, nerve predominant; perichætial leaves somewhat sheathing; capsule cernuous, or suberect, obovate, gibbous, obliquely plicate when dry; lid with a long beak. (TAB. XVIII.)

D. heteromallum *Hedw.* St. Cr. t. 26. *Turner. Smith,* Eng. Bot. t. 1272. *Schwaegr. Web. and Mohr. Bridel. Hook. and Tayl. Br. and Sch.* Monogr. p. 25. t. 15.
Angstrœmia heteromalla *C. Müller*, Syn. Musc. i. 432.

var. β. strictum; leaves erecto-patent, straight, not secund; pedicel longer, flexuose.

var. γ. interruptum; larger; stem branched, interruptedly leafy; leaves spreading or secund.

D. interruptum *Hedw.* Sp. M. t. 19. *Eng. Bot.* t. 2508.
D. caducum *Bridel. Dill.* Musc. t. 47. f. 37. (viz. f. 38.)

Hab. On moist banks, extremely common. Fr. Nov. Dec.

Growing in extensive silky patches. Leaves secund, more or less falcate or straight. Fruitstalk 1 inch long, slender, pale yellowish.

Capsule cernuous, very often bent backwards by a peculiar curvature of the top of the pedicel, obovate, gibbous, incurved, never distinctly strumose, reddish brown, glossy, when dry and empty obsoletely and obliquely furrowed, by which character and by the pale fruitstalk it may always be recognised.

An American form of this species from the United States, with a more erect cylindrical capsule, may be *D. orthocarpum*, Hedw. Sp. M. t. 30.

Sect. VII. Falcata.

68. 13. *Dicranum Blyttii* Br. and Sch. (*Blytt's Fork-Moss*); monoicous; stems cæspitose, branched, fastigiate; branches fragile; leaves flexuoso-patent or subsecund from an erect base, lanceolato-subulate, soft, entire, the nerve predominant, perichætial leaves sheathing; capsule subcernuous, more or less incurved, ovate, without striæ, strumose especially when dry; lid rostrate; teeth of the peristome narrow, inflexed when dry. (Tab. XXXIX.)

Br. and Sch. Bryol. Europ. Monogr. p. 26. t. 16.

Hab. On alpine and subalpine rocks. Teesdale, *Mr. Spruce.* Carnedd Llewelyn, Snowdon, and Cader Idris, N. Wales, *W. Wilson.* Scottish Mountains. Fr. August.

Growing in soft dull green tufts. Stems dichotomously branched, fastigiate. Leaves slightly dilated and sheathing below, spreading and usually curved or flexuose, shorter than in *D. Starkii*, of a dull deep green colour, lower ones blackish, the terminal ones fasciculate, soft, when dry somewhat crisped, areolæ at the marginal base considerably enlarged. Annulus simple. Barren flowers terminal on slender branches, or remote from the perichætium.

This species is distinguished from *D. Starkii* and *D. falcatum*, by the softer texture of the leaves, which are crisped and flexuose when dry, and by the shorter capsule, which is of softer texture, destitute of striæ, and perfectly smooth when dry; also by the distant insertion of the barren flowers. The dull deep green colour of the foliage gives the plant quite a peculiar aspect, so that it is readily known at sight.

69. 14. *Dicranum Starkii* Web. and Mohr (*Starke's Fork-Moss*); stem branched, elongated; leaves falcato-secund, subulato-setaceous from a lanceolate base, not crisped when dry, entire, nerve predominant; capsule subcernuous, oblong, arcuate, gibbous, strumose at the base, striated; annulus double; perigonium at the base of the perichætium. (Tab. XVII.)

D. Starkii *Web. and Mohr. Eng. Bot.* t. 2227. *Schwaegr.* Suppl. t. 46. *Hook. and Tayl.*

Oncophorus Starkii *Bridel.*

Bryum longifolium *Dicks.* Crypt. fasc. 3. p. 7. *Herb. Turner.*

var. β. molle; stems taller, erect; leaves wider, lanceolate,

with a distinct pagina on each side of the continuous nerve; perichætia aggregate.
D. molle *Wils. MSS.*

Hab. Alpine rocks. var. β. summit of Ben Nevis, abundant, but rare in fruit. Fr. August.

Growing in extensive fragile tufts, of an intense or yellowish-green colour. Stems 1—3 inches long and more.

This is most easily known from *D. falcatum* by its oblong, subcylindrical capsule and entire leaves. The var. β. has the appearance of a distinct species, and is remarkable for its very tall, soft, flexible stems, and purplish-brown glossy leaves, which are twice as wide as those of the typical form, the nerve not predominant, but with a distinct pagina on each side to the apex. Perichætia 2 or 3 together; but in the essential characters, especially in the form of the fruit, there is much agreement with the ordinary form, and there are intermediate states which completely connect the two extremes.

15. *Dicranum falcatum* Hedw. (*sickle-leaved Fork-Moss*); stems cæspitose, branched and fastigiate; leaves strongly falcato-secund, subulato-setaceous from a lanceolate base, denticulate, the nerve predominant; capsule cernuous, shortly obovate, strumose at the base; lid rostrate. (Tab. XVII.)

D. falcatum *Hedw.* t. 32. *Smith*, Eng. Bot. t. 1989. *Web. and Mohr. Schwaegr. Hook. and Tayl. Br. and Sch.* Monogr. p. 27. t. 18.
Oncophorus falcatus *Bridel.*
Bryum uncinatum *Dickson*, Crypt. iv. p. 11. t. 11. f, 8.

Hab. On alpine rocks. Fr. August, Sept.

Growing in dark green tufts. Stems dichotomously branched, fastigiate, denuded below. Leaves more strongly falcate than in the preceding species, denticulate near the apex, not crisped when dry. Capsule on a shorter and stouter pedicel, shortly obovate or oval, almost smooth when dry, without coloured striæ, its walls thicker, and with a distinct struma at the base. Lid and peristome larger in proportion to the capsule, the peristome of a more intense red. Annulus narrow and persistent.

Sect. VIII. Orthocarpa.

16. *Dicranum Scottianum* Turn. (*Dr. Scott's Fork-Moss*); stems densely tufted, elongated, branched; leaves crowded, spreading, subsecund, incurved, and slightly twisted at the apex when dry, lanceolato-subulate, concave, entire, nerve strong and subexcurrent; capsule elongated, slightly curved, tapering at the base; peristome short, teeth obscurely cloven. (Tab. XVIII.)

D. Scottianum *Turn.* Musc. Hib. t. 6. f. 1. *Smith*, Eng. Bot. t. 1977. *Hook. and Tayl.* Musc. Brit. ed. 2. *Bridel. Br. and Sch.* Monogr. p. 31. t. 23.

Dicranum flagellare *Turner.* *Smith*, Eng. Bot. t. 1977. (left-hand figure, only). *Hooker* in Eng. Fl. vol. 5. (not *Hedw.*)
D. Hostianum *Schwaegr.* Suppl. t. 46. *Bridel.*

Hab. On rocks in mountainous districts. Fr. July, August.

Stems 2 or 3 inches long and more, robust. Leaves erecto-patent, more or less secund, glossy and firm, incurved, but very little altered when dry, occasionally twisted near the apex, margin entire, nerve strong and prominent at the back. Capsule oblong-ovate or almost cylindrical, straight or slightly curved, smooth, yellowish-brown, with a long tapering base or neck, when dry cylindrical and obscurely plicate. Lid obliquely rostrate, shorter than the capsule. Annulus simple. Teeth of the peristome small, linear-lanceolate, entire, or slightly bi-trifid, fragile. Barren-flowered plants in separate tufts, more slender and more branched than the fertile stems.

This species differs from the true *D. flagellare*, Hedw., in the stouter leaves, not crisped when dry, with a stronger nerve; in the pale brown capsule, almost always curved; and in the small peristome. It differs from *D. fuscescens*, Turn., in the form and direction of the capsule, and in the more rigid and glossy leaves.

A variety of this species, as we presume it to be, has been repeatedly gathered in the Canary Isles, with the leaves considerably more twisted or crisped when dry, and serrulate near the apex. This may possibly be *Dicranum Muhlenbeckii* of Bruch & Schimper, or is at least very closely allied. It is probably the same as that mentioned by Schwaegrichen, whose remarks are a subject of criticism in the *Bryologia Europæa.*

The reputed variety of *D. flagellare*, growing on Cromford Moor, near Matlock, with very fine red fibres on the stem, mentioned in *Eng. Bot.*, is a tall barren state of *Campylopus flexuosus.*

71.* 16*. *Dicranum longifolium*, Hedw. Crypt. St. t. 9.

This species is included in *Muscol. Brit.* ed. 2. (TAB. XVI.); but the reputed specimens from Glenmalùr, Ireland, and from Ben Voirlich, Scotland, prove to be different from authentic examples of this moss, which must therefore be excluded from the list of British species. The specimens alluded to are both in a barren state, and may be thus characterised: —

D. circinnatum Wils. MSS.; stems elongated, flexuose, branched, radiculose; leaves circinnato-secund, subulato-setaceous, from a suddenly dilated and loosely reticulated base, serrulate at the apex, nerve thick and predominant.

Hab. Ben Voirlich by Loch Lomond: barren. *Dr. Greville.*

The dilated base of the leaf composed of large cellules, the almost entire margin, and narrower nerve, distinguish this moss from *D. longifolium.* It is nearly allied to *Dicranodontium longirostre*, but has the leaves more falcate, of firmer texture, and not deciduous.

D. heteromallum var. commutatum Wils. MSS.; stems elongated, slender, flexuose, branched; leaves circinnato-secund, very long and setaceous from an ovate base, entire, nerve predominant.

Hab. Glenmalùr, Ireland, *Dr. Taylor.*

Leaves silky, not crisped when dry. Nerve about ⅓ as broad as in *D. longifolium.*

Dicranum longifolium has denticulate subulato-setaceous leaves, gradually tapering from the base, the nerve very broad and predominant. Mr. Winch's specimen, so called, from Waskerley Park, Durham, belongs to *D. fuscescens.*

SECT. IX. SCOPARIA.

2. 17. *Dicranum fuscescens* Turner (*dusky Fork-Moss*); stems elongated, loosely tufted, branched; leaves spreading, subsecund, subflexuose, crisped when dry, lanceolato-subulate, canaliculate, denticulate at the apex, nerve excurrent; capsule oblong, incurved, cernuous, furrowed when dry; lid with a long beak. (TAB. XVIII.)

D. fuscescens *Turn.* Musc. Hib. (1804) p. 60. t. 5. f. 1. *Smith*, Fl. Brit. Eng. Bot. t. 1597.

D. congestum *Bridel*, Sp. Musc. (1806) i. p. 176. *Schwaegr.* Suppl. t. 42. *Br. and Sch.* Monogr. p. 36. t. 29.

D. scoparium β. fuscescens *Hook. and Tayl.* (TAB. XVIII. fig. β.)

var. β. longirostrum; leaves narrower, distinctly serrated; capsule shorter, ovate, with ferruginous striæ; lid often longer than the capsule.

D. longirostre *Schwaegr.* Suppl. t. 44.

var. γ. flexicaule; stem very long, flexuose, ascending, more slender and less densely clothed with radical fibres; leaves secund or falcate, more glossy, scarcely crisped when dry; capsule shortly ovate, much curved.

D. flexicaule *Bridel*, Bryol. Univ.

var. δ. robustum; like D. scoparium, loosely tufted; leaves longer, lower ones blackish, upper ones dull green; capsule incurved.

Hab. On rocks in alpine and subalpine districts, sometimes at the roots of trees. vars. β. γ. δ. not found in Britain.

Fr. August.

Stems 2 or 3 inches high, dull yellowish green, or sometimes of a deeper rusty green. Leaves rather crowded, especially at the summit of the stem, secund, or spreading every way, flexuous, and sometimes twisted, especially when dry; lower leaves brownish, subulate from a lanceolate base, canaliculate, minutely toothed towards the apex, the nerve rather strong and excurrent. Fruitstalks an inch long, yellowish. Capsule cernuous, ovate or oblong (always shorter, and considerably more incurved, than that of *D. scoparium*), pale-yellowish or reddish brown, striated, especially when dry, its walls rather thick, scarcely strumose at the base. Lid with a very long beak. Annulus fragmentary, composed of a double layer of cellules. Inflorescence dioicous.

This is distinguished from *D. scoparium* by the short, decidedly cernuous, striated, pale capsule, and by the leaves, which have a considerably thicker and broader nerve, and are crisped when dry. In the shape of the leaves, and in the nerve, it approaches to *D. Scottianum*, but is easily recognised by the fruit.

73.

18. *Dicranum scoparium* Hedw. (*broom Fork-Moss*); dioicous; stems elongated, loosely tufted, robust, dichotomously branched, densely covered with radicular fibres; leaves secund or falcato-secund, lanceolato-subulate, carinato-concave, with inflexed margins, serrated at the apex, nerve with several prominent ridges at the back, and toothed towards the summit; perichætial leaves larger, convolute; capsule cylindrical, slightly curved, coriaceous; annulus none; lid with a long beak. (TAB. XVIII.)

D. scoparium *Hedw.* Sp. M. t. 126. *Smith,* Eng. Bot. t. 354. *Turner. Schwaegr.* Suppl. t. 42. *Web. and Mohr. Bridel. Hook. and Tayl.* (TAB. XVIII. left-hand figure.) *Br. and Sch.* Monogr. p. 34. t. 26, 27.

Bryum scoparium *Linn.* Sp. Plant. (ex parte ! sec. Herb. Lin.)

Dicranum Dillenii *Taylor MSS. Dill.* Musc. t. 46. f. 16. A. B. C. E. H.

var. β. orthophyllum; more closely tufted; stem erect; leaves erecto-patent or subsecund, straight.

var. γ. curvatum; branches curved, ascending; leaves more falcate; capsule shorter.

Hab. Shady banks and rocks, very common.

Fr. July, August.

Tufts yellowish-green, from 2—4 inches in height or more. Stems rather rigid, covered everywhere with pale or rusty radicular fibres. Leaves glossy, lanceolate at the base, thence linear-subulate, when dry slightly and obscurely striated, not crisped, the nerve narrow, marked externally with about 4 prominent ridges, the ridges serrated towards the apex of the leaf, which is also more or less serrated in the margin. Fruitstalk reddish, about 1½ inch long. Capsules rarely 2 together from the same perichætium, suberect, cylindrical, slightly incurved, chestnut coloured, the walls thick and coriaceous, scarcely, if at all, furrowed when dry. Teeth of the peristome deep red, incurved, bi-trifid, with prominent bars internally. Spores small, reddish-brown. Annulus none. Barren-flowered plants generally in separate tufts.

American specimens in Drummond, *Musc. Am.* No. 80., have shorter more crowded stems, and shorter more distinctly serrated leaves, with barren gemmiform flowers nestling among the radicles of the fertile stem, as well as separate barren stems. This form might be taken for a distinct species, but an intermediate form is found at Ross, in Herefordshire, by Mr. Purchas; several other varieties are mentioned by Bridel in the *Bryologia Universa*, i. p. 412.

4. 19. *Dicranum palustre* Bridel (*marsh Fork-Moss*); stems elongated, cæspitose, erect, branched, subfastigiate; leaves spreading, the terminal ones crowded into a cuspidate cluster on the barren shoots, and subsecund, glossy, linear-lanceolate, undulated; nerve very thin and narrow, ceasing below the serrated apex; capsule suberect, oblong, subcylindrical, slightly curved, striated; annulus none. (TAB. XVIII.)

D. palustre *Bridel*, Bryol. Univ. i. 814. *Br. and Sch.* Monogr. p. 39. t. 31.

D. undulatum *Turn. Smith*, Eng. Bot. t. 2260. (except the fertile specimen which is not of British growth). *Hook. and Tayl.* t. xviii. *Dill.* Musc. t. 46. f. 16. C. (fide Hooker and Arnott).

D. Bonjeani *De Notaris. C. Müller*, Syn. Musc.

var. β. juniperifolium, with shorter, wider, and more rigid leaves.

D. juniperifolium *Sendtner.*

var. γ. polycladum; innovations much branched; branches slender, flagelliform, with small imbricated leaves.

Hab. In marshy places, and on shady moist banks.

Fr. Sept.

Growing in tall extensive patches. Stems 4 inches long and more, especially when barren, clothed with pale or rusty radicular fibres. Leaves more or less spreading (except at the summit of the barren shoot, where they form a cuspidate erect cluster), shining and undulated, especially when dry, linear-lanceolate from a lanceolate base; the nerve thinner than in *D. scoparium*, without ridges at the back, and ceasing below the apex, which is more strongly serrated; reticulation larger and more distinct than in that species. Fruitstalk paler, barren flowers (not seen by Br. & Sch.) gemmiform, nestling in the axils of the leaves of the fertile stem, and apparently a growth from the radicular fibres.

It is highly probable that this species has been generally confounded with *Dicranum polysetum* Swartz & Schwaegr. They have certainly been considered as one species, by British writers on Bryology, ever since Sir J. E. Smith unconsciously united them in *Eng. Bot.*; nor is it quite evident, from the remarks of Weber and Mohr, *Bot. Tasch.* p. 176., that Swartz himself was aware of the difference. Authentic specimens, to which we have not access at present, must determine whether *D. undulatum* of Ehrhart and of Schrader, and *Bryum rugosum* of Hoffmann, are the same as *D. palustre.* It is difficult to believe that a moss of such frequent occurrence should have been entirely overlooked, and the supposition is far more admissible that it has been mistaken for a form of *D. polysetum* (*D. undulatum*, Br. & Sch., not Turn.). It is observable that Schrader thought *Bryum rugosum*, Hoffm., to be only a variety of *Dicranum scoparium. D. palustre* does indeed resemble *D. scoparium* in many points, especially in the form of the capsule, but is distinguishable at all times by the brilliant, undulated, more strongly serrated leaves, which have a thinner nerve. It essentially differs from *D. polysetum* in the solitary fruitstalks, and in the more erect cylindrical capsule, as well as in the structure of the leaves.

SECT. X. SPURIA.

75. 20. *Dicranum Schraderi* Schwaegr. (*Schrader's Fork-Moss*); stems elongated, densely tufted; leaves crowded, more or less spreading, subsecund, lanceolate-oblong, rather obtuse, carinato-concave, subrugose, toothed in the margin and on the keel, subpapillose on the back near the apex; capsule cernuous, oval-oblong, incurved; lid rostrate. (TAB. XXXIX.)

D. Schraderi *Schwaegr.* Suppl. t. 61. *Web. and Mohr. Br. and Sch.* Monogr. p. 40. t. 32.
D. undulatum *Bridel.*

Hab. In turfy bogs; rare in Britain. Risley Moss, near Warrington, sparingly; barren. Wybunbury Bog, Cheshire, in fruit, *W. Wilson.* Fr. Sept.

The Risley specimens have the leaves more widely spreading and crisped than in any others that we have seen, and constitute a well marked variety. Stem 3—6 inches long. Leaves oblong-lanceolate, rather obtuse, undulated, when dry flexuous and curved at the top, somewhat keeled, distantly toothed, the nerve rather strong, ceasing below the apex, which is papillose at the back. The capsule in this species is not unlike that of *D. fuscescens* Turn.; and there is an American form, in Drummond's *Musci Americani*, with narrow attenuated leaves, which seems to be quite intermediate in character between the two species, though in habit more resembling *D. Schraderi*, to which species we suppose it to belong.

76. 21. *Dicranum spurium* Hedw. (*wide-leaved Fork-Moss*); stems loosely cæspitose, covered with radicular fibres; leaves ovate-lanceolate, acuminate, undulated, serrated, papillose on the back; nerve ceasing below the apex; capsule cernuous, arcuate, subcylindrical, slightly strumose, striated. (TAB. XVII.)

D. spurium *Hedw.* St. Cr. t. 30. *Smith*, Eng. Bot. t. 2167. (omitting the fruit?). *Schwaegr. Web. and Mohr. Hook. and Tayl. Br. and Sch.* Monogr. p. 41. t. 33.
Bryum spurium *Dickson.*

Hab. On moors, and in bogs. Barmby Moor, near Pocklington, Yorkshire, *Mr. Teesdale.* Found there recently, and also in Stockton Forest, and on Langwith Moor, by *Mr. Spruce.* Kinnordy, Scotland, *Mr. Lyell.* Fr. June.

This fine species, more frequently growing on sandy heaths, and in gravelly places in woods, than in turfy bogs, according to Bruch & Schimper, is not often found in fruit. Mr. Spruce has been so fortunate as to find fertile plants on Barmby Moor, with stems nearly 3 inches long. It forms extensive tufts, more or less coherent. Stems robust, rigid, dichotomously branched, clothed with rusty radicular fibres, which are mostly concealed by the large imbricated leaves. Leaves more or less spreading, occasionally subsecund, more erect and loosely imbricated when dry, in which state the points are slightly crisped and flexuous: they are widely lanceolate below, tapering upwards to a narrow point, concave and inflexed in the margin, undulated, minutely toothed in the upper half, nerve subexcurrent. Fruitstalk 1½ inch long, pale yellowish, sometimes 2 together in the same perichætium. Capsule oblong, cernuous, arcuate, furrowed when dry, pale yellowish-brown. Lid with a long beak. Barren flowers, gemmiform, nestling in the axillæ of the leaves of the fertile stem, among the radicular fibres.

This moss has a very peculiar aspect, and is distinguished from the preceding species by the broad tapering leaves. The stems have also an annotinous or interrupted growth, and the barren shoots are cuspidate at the apex from the clustered erect leaves. It is one of the finest of the genus. The capsule represented in *Eng. Bot.* may belong to *Ceratodon purpureus*, which is sometimes mixed with this moss.

SECT. XI. PROCERA.

22. *Dicranum majus* Turner (*tall Fork-Moss*); stems elongated, loosely cæspitose; leaves falcato-secund, lanceolato-subulate, concave, dentato-serrate at the apex; capsule horizontally cernuous, curved; lid with a long beak; fruitstalks pale, aggregate. (TAB. XVIII.)

D. majus *Turner*, Musc. Hib. (1804) p. 59. t. 4. *Smith*, Eng. Bot. t. 1409. *Schwaegr.* Suppl. t. 40. *Br. and Sch.* Monogr. p. 43. t. 37.

D. scoparium var. *a.* majus *Hook. and Tayl. Dill.* Musc. t. 46. f. 16. D.

Bryum scoparium *Linn.* Sp. Pl. (ex parte, confer. Herb. Linn.)

Hab. Shady banks and rocks in woods, &c. Fr. July, August.

Stems 4—6 inches long, covered with radicular fibres. Leaves falcato-secund, both in a wet and in a dry state, lanceolato-subulate, concave, dark or brighter green, somewhat glossy, never subexcurrent, stronger, and with more numerous ridges than in *D. scoparium.* Calyptra and lid unusually long. Annulus none. Capsule cernuous, incurved, furrowed when dry, olive-brown, blackish when old and empty, as Dillenius correctly remarks. Teeth of the peristome broader and shorter than in *D. scoparium*, of a duller red or ferruginous colour, the internal trabeculæ less prominent. Barren flowers gemmiform, nestling in the cauline radicles as in the preceding species.

The pale aggregate fruitstalks, olivaceous cernuous capsules, and long falcate leaves, essentially distinguish this species from *D. scoparium.* The two species have been seen growing in company preserving their proper characters; indeed, no one who compares them attentively will hesitate to pronounce them distinct. Dillenius long ago pointed out the difference between them.

17. LEUCOBRYUM *Hampe.*

Calyptra pale, membranaceous, subscariose, cucullate; when young slightly inflated below, as in *Syrrhopodon.* *Capsule* cernuous, striated, its walls opaque, thick, and firm, furrowed when dry, strumose at the base. *Annulus* none. *Lid* rostrate. *Teeth* of the peristome 16, inserted below the mouth of the capsule, bifid, internally trabeculate, with numerous longitudinal striæ, as in *Trematodon*, incurved. *Spores* small. *Vaginula* oblong, subcylindrical.

Stems dichotomously branched, more or less densely cæspitose, without radicular fibres, rigid, and blackish. *Leaves* white or pale-glaucous, crowded, suberect, subsecund, lanceolato-subulate, semi-amplexicaul, canaliculate above, formed of two or more distinct strata of large rectangular-oblong parenchymatous cellules, communicating with each other by circular pores, without chlorophyll; marginal cells prosenchymatous, narrow and elongated, disposed in a single layer. *Inflorescence* monoicous. *Fertile flower* terminal. *Archegonia* 8—12, with very long, slender styles; no paraphyses. *Barren flowers* gemmiform, clustered, arising from a mass of radicular fibres which crown the abortive female flower, subsequently developed into a slender ramulus, with terminal and lateral flowers. *Antheridia* about 4 together, very small, with filiform paraphyses, somewhat longer than the antheridia.

This genus is intermediate between *Dicranum* and *Leucophanes* Bridel, agreeing with the first in the capsule and peristome, and with the latter in the singular texture of the leaves, which is analogous also to that of *Octoblepharum* and of *Syrrhopodon*, and very different from that of *Sphagnum*. An exotic species of this genus (*Dicranum candidum* Schwaegr.) is remarkable for its almost pleurocarpous fructification, analogous to that of *Dicranum Sieberianum* Schwaegr., which is figured and described in *Hook. Musc. Exot.* under the name of *Leucodon pallidus*. The generic name λευκος, *white*, is expressive of the colour of the foliage, and is applied to those Sphagnum-like species of *Dicranum* which have leaves composed of a double layer of cellular tissue. *Sphagnum Javense* Schwaegr. Suppl. t. 102., belongs to this genus.

78. *Leucobryum glaucum* Hampe (*white-leaved Fork-Moss*); stems repeatedly dichotomous, elongated, fragile; leaves crowded, erect, subsecund, lanceolato-subulate, canaliculate, rather obtuse and apiculate; capsule cernuous, strumose, furrowed when dry; lid with a long beak. (Tab. XVI.)

Leucobryum glaucum *Bryol. Eur.* fasc. 41. t. 1.
Dicranum glaucum *Hedw.* Sp. M. *Schwaegr.* Suppl. t. 48. *Web. and Mohr. Turner. Smith,* Eng. Bot. t. 2166.
Oncophorus glaucus *Bryol. Eur.* (name since changed).
Bryum glaucum *Linn.* Sp. Pl. *Dill.* Musc. t. 46. f. 20. and t. 83. f. 8.

Hab. On moist heaths, turbaries, and in moist woods; rare in fruit. Near Rufus' Stone, New Forest, in fruit, *Mr. Lyell.* Ireland, *Miss Hutchins.* South of Scotland. Hampshire. Gloucestershire; and in a few other places. Growing in very extensive, compact, but incoherent tufts, of a whitish colour. Fr. March.

Stems 2—8 or more inches long; repeatedly dichotomous and fastigiate, fragile. Leaves subulate from an ovate-lanceolate amplexicaul base, entire, canaliculate above, the lower half with a narrow thin and membranous border, the rest of the leaf thick and succulent, composed of 2 strata of rectangular cellules with intercellular cavities and pores; in the lower portion of the leaf frequently increased to 3 or 4 layers of cellules. Fruitstalks frequently two together in the same perichætium, red. Capsule reddish-brown or purplish.

This cannot be confounded with any other British moss.

18. CERATODON *Bridel.*

Didymodon *Hook and Tayl.*

Capsule on a long subflexuose pedicel, suberect, or cernuous, oblong, or cylindrical, with a short ventricose or strumose neck, striated, or uniformly coloured, angular, or widely furrowed when dry, its walls thick and firm, composed of elongated cellules. *Lid* conical, subrostellate. *Calyptra* cucullate, with a long beak. *Annulus* broad, with double row of cellules, deciduous. *Peristome* single; *teeth* 16, lanceolate, very deeply cloven or composed of two equal subulate portions, connected below by transverse internally prominent articulations, converging when wet, *spirally incurved when dry*, composed of two differently coloured laminæ, the outer one red, narrower than the inner one, which is yellow. *Spores* small. *Vaginula* oblong.

Stems growing on the soil, perennial, cæspitose, with innovations, usually 2 together, from below the fertile flower, hence repeatedly and dichotomously branched and fastigiate. *Leaves* in three or five vertical rows, crowded, lanceolate or lanceolato-subulate, concave, entire, with a roundish nerve; *areolæ* small, quadrate, or dotlike above, larger, elongated, and pellucid below.

Inflorescence dioicous, terminal.

A genus intermediate between *Dicranum* and *Trichostomum*, allied to the first of these in the capsule and peristome, and to the latter in the mode of growth, ramification, and foliage. Its true place in the series is not very obvious, and one species, referred hither by Bruch and Schimper, is quite ambiguous in its character. Name from *κερας*, *a horn*, and *οδων*, *tooth;* the teeth having some resemblance to a goat's horn.

SECT. I. *Leaves oblong-lanceolate, carinate; capsule angular when dry.*

79. 1. *Ceratodon purpureus* Bridel (*purple Fork-Moss*); stems cæspitose, dichotomously branched; leaves oblong-lanceolate, margin recurved, nerve excurrent; capsule oblong or oval, regular or slightly curved, erect, or subcernuous, cernuous and horizontal when dry; lid conical; teeth of the peristome united below by a basilar membrane, equally bifid, with crowded transverse bars below, margin pale. (TAB. XX.)

C. purpureus *Brid.* Bryol. Univ. *Br. and Sch.* Monogr. p. 5. t. 1 and 2.
Dicranum purpureum *Hedw.* Sp. Musc. t. 36. *Turner. Smith*, Eng. Bot. t. 2262. *Schwaegr. Web and Mohr.*
Didymodon purpureus *Hook. and Tayl. Dill.* Musc. t. 49. f. 50, 51, 52, and 54.
Dicranum Celsii *Hedw.* Sp. Musc. t. 33.
D. purpurascens *Ibid.* t. 35.
D. intermedium *Ibid.* t. 31.
D. strictum *Smith*, Eng. Bot. t. 2294.
D. bipartitum *Smith.*
Trichostomum papillosum *Smith*, Eng. Bot. t. 2533.
Bryum papillosum, *Dickson*, Crypt. fasc. 4. t. 11. f. 5.
B. strictum, tenue, and bipartitum, *Dickson.*
Mnium purpureum *Linn.*
Bryum Celsii *Linn.*

Hab. Very common on banks, &c., not only throughout Britain, but in all parts of the world. Fr. April, May.

Growing in rather soft extended patches of a dull green colour. Stems varying in length, according to age and local circumstances, from $\frac{1}{4}$ inch to 3 inches. Leaves spreading from an erect base, slightly incurved at top, suberect and slightly twisted or crisped when dry, keeled, margins reflexed, entire, or scarcely denticulate at the apex; nerve rather strong, roundish, excurrent; perichætial leaves larger, sheathing. Capsule on a purplish-red fruitstalk, elliptic-oblong or subcylindrical, slightly bent and irregular, purple, shining, furrowed when dry, with a short tumid struma at the base. Lid conical, acute, sometimes subrostellate. Teeth of the peristome long, narrow, and deeply cloven, the segments when dry spirally incurved, often in a greater degree than is shown in the figure given by Bruch and Schimper. Barren-flowered plants more slender than the fertile ones.

This species is subject, according to locality, to many variations, but, when once known, can be recognised even in a barren state. It is a great ornament of walls, &c. in early spring and in winter, when the young bright-red fruitstalks appear. A closely allied species, *C. stenocarpus* Br. and Sch., from the Neelgherry mountains, and from Mexico, is distinguished by the narrower capsules and pale slender fruitstalks. The peristome of *C. purpureus* is a very beautiful object under the microscope.

SECT. II. *Leaves subulate from a dilated base; capsule smooth.*

2. *Ceratodon cylindricus* Br. and Sch. (*narrow-fruited Fork-Moss*); stems gregarious, dwarfish; leaves subulate from an ovate sheathing base, widely spreading and flexuose above, denticulate, nerve predominant; capsule on a pale slender fruitstalk, cylindrical, erect or slightly curved, smooth when dry; lid conical. (TAB. XXXIX.)

Bryol. Europ. Monogr. p. 6. t. 3.
Trichostomum cylindricum *Hedw.* Sp. Musc. t. 24. *Schwaegr.* *Bridel.* *Wahlenberg.*
T. tenuifolium and tenue *Schrader*, in Herb. Smith.
Didymodon cylindricus *Wahlenberg*, Fl. Suec. *Hartmann.* *Hook.* in Eng. Flora, vol. 5.
Dicranum cylindricum *Web. and Mohr.*
Angstrœmia cylindrica *C. Müller*, Syn. Musc.

Hab. On sandy banks, in moist shady places; not common; rare in fruit. On several ditch banks near the Botanic Garden, Belfast, with old capsules, Nov. 1830, *T. Drummond.* Lancashire and Derbyshire, *W. Wilson.* On old charcoal stools in the Castle-Howard Woods, Yorkshire, growing with *C. purpureus*; also in Stockton Forest, *Mr. Spruce.* Fr. April. May.

Stems loosely cæspitose or gregarious, about ¼ inch long, sparingly branched. Leaves very narrow, spreading and flexuose in the upper part, dilated and sheathing below, more crisped when dry, the narrow spreading portion formed of the solid predominant nerve, which is minutely but sharply denticulate at the edges and back, or somewhat papillose. Perichætial leaves with larger sheathing bases, spreading above. Capsule narrow, slightly curved, suberect, reddish or yellowish-brown, rather glossy, more curved when dry. Fruitstalk about an inch long, slender, pale. Vaginula oblong. Calyptra reaching half way down the capsule. Lid conical, about ⅕ of the length of the capsule. Annulus as in the preceding species, and the peristome very similar in structure. Barren-flowered plants more slender than the fertile ones.

This moss in the foliage is not unlike *Dicranum crispum*, nor very different from *Bryum pyriforme*, with which it sometimes grows. It is allied also to *Dicranum Grevilleanum*, and is sometimes found growing with it. From all these it may be easily distinguished, when in fruit, by the cylindrical capsule, and in a barren state by the sharply denticulate or papillose leaves.

SUBORDER VI. CAMPYLOPODEÆ.

19. DICRANODONTIUM *Bruch and Schimper.*

DIDYMODON *Weber and Mohr.* *Bridel.*
CYNODONTIUM *Schwaegr.*

Capsule on an elongated arcuate fruitstalk, smooth, elliptic-oblong, of thin texture. *Lid* conico-subulate. *Annulus* small, persistent. *Calyptra* cucullate, entire at the base. *Peristome* single; *teeth* 16, linear-lanceolate, distantly trabeculate, cloven almost or quite to the base into two unequal divisions, obliquely striated. *Spores* small. *Vaginula* oblong.

Stems cæspitose, erect, with innovations from below the flowering apex, tomentose with radicles.

Leaves erecto-patent, falcato-secund, subulato-setaceous from a dilated and sheathing base, fragile and deciduous; *nerve* broad and predominant; *areolæ* narrow, larger and quadrate at the base of the leaf.

Inflorescence dioicous. *Flowers* gemmiform, terminal.

Perennial, growing on the ground, in mountainous districts, or occasionally on rocks; in habit resembling *Dicranum*, and still more nearly allied to *Campylopus*, from which it is distinguished by the smooth capsule, by the entire (not fringed) calyptra, by the rudimentary annulus, the long narrow teeth of the peristome, which are not confluent at the base, but almost constantly cloven to the very base and inserted below the orifice of the capsule, and by the more lax tissue of the leaves and perfectly smooth nerve. Only one species is as yet known. Name from δικρανος, *forked*, and οδων, *tooth.*

81. *Dicranodontium longirostre* Br. and Sch. (*beaked Swan-neck Moss*); the only species of the genus. (Tab. XXXIX.)

Bryol. Europ. fasc. 41. p. 2. t. 1.

Didymodon longirostrum *Web. and Mohr.* Bot. Tasch. p. 155.

D. longirostris *Bridel*, Br. Univ. i. p. 512.

Cynodontium longirostre *Schwaegr.* Suppl. i. 1. p. 111. t. 29.

Dicranum denudatum *Bridel*, Sp. Musc. *C. Müller*, Syn. Musc.

Dicranum flexuosum *Bridel*, Musc. Recent. *Röhling. Schleicher*, Cent. n. 19. (not of *Smith*, nor of *Turner*).

Bryum pilosum, molle, setis, intortis, *Dill.* Musc. t. 47. f. 33. A—E?

Hab. In mountainous woods; rare. Cromagloun, near Killarney, barren, June 1841, *Dr. Taylor.* Fr. Oct.

Growing in rather dense broad yellowish silky patches. Stems 1—3 inches in height, blackish, covered in the lower part with reddish radicles. Leaves more or less falcato-secund, interruptedly crowded, often deciduous and fragile, subulato-setaceous from an ovate dilated sheathing base, channelled, very narrow above, denticulate near the apex, yellowish-green, glossy; nerve broad, occupying all the upper portion of the leaf; areolæ narrow, oblong; large, diaphanous and quadrangular at the sheathing base of the leaf. Perichætial leaves larger and more sheathing below. Fruitstalk about ½ inch long, pale yellow, rather thick, much curved when moist, and the capsule then concealed amongst the leaves, erect when dry. Capsule elliptic-oblong, pale olive, while filled with the small olive-coloured spores, afterwards yellowish-brown, reddish at the mouth, smooth (not furrowed) when dry. Lid conico-subulate, shorter than the capsule. Annulus very narrow, persistent. Peristome reddish, variable in length and in colour, the teeth usually cloven to the base into two unequal segments, either quite free, or connected together by cross bars for a fourth or fifth of their length. Calyptra twice as long as the lid, not fringed at the base.

Dicranodontium longirostre very much resembles *Trichostomum flexicaule* in general aspect, but may be known at once by the dilated, sheathing, loosely reticulated bases of the leaves, and by their great tendency to fall off when dry; they are also of a more glossy yellow hue, with more elongated areolæ, and at intervals more crowded and fasciculate. From *Campylopus flexuosus* this moss may be distinguished by the same characters, and by the narrower, more lax, and spreading foliage. The Dillenian figures, above cited, agree much better with this moss than with *Campylopus flexuosus*, especially in the length of the fruitstalk, and in the oblong capsules, although all the specimens in the Dillenian *Herbarium*, except those received from Haller, are stated, in the report of Hooker and Arnott, to belong to the latter species.

20. CAMPYLOPUS *Bridel.*

DICRANUM (partly) *Hooker and Taylor. C. Müller*, Syn. Musc.

Capsules usually aggregate, each from a separate perichætium, on an arcuate or geniculate and deflexed fruitstalk, oval or oblong, regular, or gibbous on the upper side, tapering at the base, striated, furrowed when dry. *Lid* conico-subulate, or rostrate. *Annulus* large, spirally dehiscent. *Calyptra* cucullate, rather large, fringed at the base with ciliary processes. *Peristome* single; *teeth* 16, narrowly lanceolate, deeply bifid, as in *Dicranum heteromallum* and the allies. *Spores* small. *Vaginula* oblong.

Stems with dichotomous branches; *innovations* in pairs, radiculose in all parts, or at the base only, densely leafy.

Leaves crowded in eight rows, erecto-patent, or falcato-secund, imbricated at the base, rather rigid, glossy, lanceolato-subulate, or lanceolato-setaceous, sometimes piliferous, concave, channelled, or convolute, denticulate at the apex only; the *nerve* very broad, sometimes furrowed at the back; *areolæ* subquadrate, or rhomboid at the base, narrow and elongated above.

Inflorescence dioicous. *Perigonia* terminal, solitary or aggregate, gemmiform, or capituliform. *Antheridia* oblong, shortly pedicellate, with long filiform paraphyses. *Fertile flowers* usually aggregate. *Archegonia* with long filiform styles, with or without short paraphyses.

Perennial mosses, growing upon rocks, and upon soil in moist, heathy places, turbaries, woods, &c.

This genus (named from καμπυλος, *bent*, πους, *foot*, in allusion to the curved fruitstalk) is allied in habit, &c., to *Dicra-*

num heteromallum, differing in the arcuate fruitstalk, fringed calyptra, and almost symmetrical furrowed capsule. Mr. Valentine has also pointed out a peculiarity in the hooked extremity of the fruitstalk within the vaginula. (See *Musci Nottinghamienses.*)

Bruch and Schimper describe seven species in the *Bryologia Europæa.*

82. 1. *Campylopus densus* Schleicher (*pale Swan-neck Moss*); stems densely cæspitose, radiculose; leaves much crowded, erecto-patent, rather rigid, lanceolato-subulate, loosely reticulated at the base. (Tab. XL.)

Campylopus densus *Br. and Schimper*, Bryol. Eur. fasc. 41. p. 6. t. 5.
Dicranum densum *Schleicher.*
Campylopus penicillatus *Bridel*, Bryol. Univ. i. p. 478. (according to *Bridel*, Bryol. Univ. i. p. 815.)

var. β. fragilis; stems shorter, fragile, with axillary deciduous branches. (Tab. XL.)

Campylopus fragilis *Bryol. Eur.* fasc. 41. p. 4. t. 2.
Dicranum flexuosum β. fragile *Turner*, Musc. Hib. (partly). *Smith* (partly). *Bridel*, Bryol. Univ. i. 470.
Bryum fragile *Dickson. Hoffman.*
Dicranum densum *Funk*, Crypt. Gew. 634.

Hab. On shady sandstone rocks, and in woods in a turfy or sandy soil, Alderley Edge and Frodsham Rocks, Cheshire. In fruit, near Bantry, Ireland, 1808, *Miss Hutchins*, in *Herb. Turner;* and on sand rocks at Ardingley, Sussex, *Mr. Mitten.* Near Todmorden, in fruit, growing intermixed with *C. torfaceus*, *Mr. John Nowell.* Fr. Nov. March.

Stems ½ inch to 3 inches in height, dichotomously branched, densely tufted, brittle, tomentous, with brown or pale whitish radicles; in the var. β., crowned with numerous fasciculate axillary deciduous branches or flagella. Leaves suberect, slightly recurved when moist, straight and appressed when dry, lanceolato-subulate, slightly denticulate at the apex; nerve very broad and predominant; areolæ quadrate, large, pale and diaphanous at the base, the upper stratum of cellules (seen in a transverse section of the leaf) twice or thrice as large as those which constitute the nerve; hence the texture of the leaf approaches in aspect to that of *Sphagnum.* Fruitstalk rather thick, bent near the middle. Capsule drooping or pendulous, oval, of thick texture, furrowed when dry, brown. Lid rostrate, as long as the capsule. Barren plants shorter than the fertile, with which they are intermixed; barren flowers aggregate, compressed.

In this reunion of two forms described as separate species in the *Bryologia Europæa*, we have been guided by evidence derived from an attentive study of numerous examples. The specimens, in fruit, which we have received from M. Schimper under the name of *C. fragilis*, appear to us to be only a small state of *C. flexuosus*, between which and *C. densus* a much greater difference exists than between the latter and *C. torfaceus*, under which name both forms or species have been sent to us by M. Schimper, and it is not easy to decide whether they are truly distinct. *C. densus*, however, may be known from *C. torfaceus* by the shorter, subulate, not setaceous leaves, which are more crowded, more rigid, with a broader nerve, and by the thicker and shorter fruitstalk. It may be easily recognised by the straight glossy leaves with white bases. *C. pallidus* Hook. and Wils. MS., from the Andes of Quito, is closely allied to this, and may perhaps be a robust variety of the same species.

2. *Campylopus torfaceus* Bruch and Schimper (*dwarf Swan-neck Moss*); stems cæspitose, slender, dwarfish, rooting at the base only; leaves loosely imbricated, erecto-patent, setaceous from an ovate-lanceolate base; nerve narrower, predominant; capsule smaller, on a longer pedicel. (Tab. XL.)

Campylopus torfaceus *Bruch and Schimper*, Bryol. Eur. fasc. 41. p. 4. t. 3.
Dicranum turfaceum *C. Müller*, Syn. Musc.
Dicranum flexuosum *Hedwig*, Sp. Musc. t. 38. *Hook. and Tayl.* (partly). *Dill.* Musc. t. 47. f. 33. F. G.?
D. flexuosum var. β. fragile *Smith. Turner* (partly).
Campylopus flexuosus *Bridel*, Bryol. Univ. (partly).
C. pyriformis (Schultz) *Bridel*, Bryol. Univ. i. 471. ?

Hab. In turbaries, and at the sides of ditches, with *Dicranum cerviculatum.* Fr. Oct., Nov.

Stems ½ inch to 1 inch in height, slender, rooting at the base only. Leaves less crowded than in the preceding, gradually longer and larger towards the top of the stem, erecto-patent or subsecund, yellowish or pale green, at length brownish; lower leaves ovate-lanceolate, or lanceolate; upper leaves ovate-lanceolate at the base, thence setaceous; the nerve narrower than in the preceding species; areolæ at the base large and quadrate as in that. Capsules oval, brownish when fully ripe, often several on the same stem. Fruitstalk ½ inch long, slender, suddenly bent near the middle, straight and erect when dry.

Hedwig's figure seems to belong to this species, and not to *C. flexuosus*, under which it is cited in the *Bryologia Europæa*. *C. torfaceus* differs from *C. densus* in the longer setaceous leaves, more dilated at the base, and in the longer and more slender fruitstalk; but intermediate forms of one or the other species are sometimes present, and we are not yet fully satisfied that the two are essentially distinct.

3. *Campylopus setifolius* (*silky Swan-neck Moss*); stem slender, elongated, dichotomous; leaves distant, spreading, setaceous from a lanceolate base, serrulate. (Tab. XL.)

Hab. In rocky places on mountains. On Carrig Mountain, near Dunkerron, Ireland, *Dr. Taylor.* Fr. ?

Stems 2—3 inches long, blackish, loosely cæspitose, radiculose at the base, and at the insertion of the branches. Leaves scattered, more or less spreading, straight, straggling and flexuose when dry, lanceolate at the base, setaceous and very narrow in the upper part, longer than in the preceding species, more evidently serrulate in the margin and at the back; nerve rather narrow, but occupying the upper half of the leaf; upper leaves yellowish-green, very glossy when dry; lower leaves dark brown; areolæ rhomboid, larger at the base. Fertile flowers aggregate. Fruit unknown.

85. 4. *Campylopus flexuosus* Dill., Lin. (*rusty Swan-neck Moss*); stem radiculose, branched; leaves erecto-patent, or falcato-secund, lanceolato-subulate, rather rigid, obsoletely furrowed at the back; nerve broad; capsule oblong, wide-mouthed; teeth of the peristome spreading when dry. (TAB. XVI.)

Campylopus flexuosus *Bridel*, Bryol. Univ. i. 469. (partly). *Bruch and Schimper*, Bryol. Eur. fasc. 41. p. 3. t. 1.

Dicranum flexuosum *C. Müller*, Syn. Musc. *Hooker and Taylor* (partly), (not *Hedwig*, Sp. Musc. t. 38.) *Eng. Bot.* t. 1491. *Dill.* Musc. t. 47. f. 33. A—E.

D. flexuosum var. γ. piliferum *Turner*, Musc. Hib. t. 5. f. 2. a.

D. flexuosum var. δ. elongatum *Turner*, Ib.

Hab. On moist shady rocks, mostly in subalpine districts. Fr. Nov.

Stems ½ inch to 2 inches in height, erect, cæspitose, dichotomously branched, clothed with purplish radicles, and often bearing deciduous flagelliform ramuli. Leaves either straight and spreading, or secund and somewhat falcate, not much altered by drying, lanceolato-subulate; upper ones pale or yellowish-green, denticulate at the apex; lower leaves reddish at the base, channelled, the nerve broad and well defined, the narrow pagina of the leaf continued almost to the apex; areolæ elliptic-oblong, larger and subquadrate at the base. Capsule oval, regular, or gibbous, at first olive, subsequently pale brown, furrowed when dry. Lid rostrate, shorter than the capsule. Annulus large. Teeth of the peristome bifid to the middle, trabeculate, reddish-brown, slightly spreading when dry. Spores small. Calyptra pale, brownish at the top, fringed at the base.

This species is known by the reddish bases of the older leaves, which taper gradually from the base, and have the nerve stronger than in *C. torfaceus*; the areolæ also, except at the very base, are smaller, and the capsule is narrower when dry.

A barren variety with dark green foliage, crisped when dry, is found on wet heaths near Warrington.

86. 5. *Campylopus longipilus* Bridel (*bristly Swan-neck Moss*); stems cæspitose, elongated, dichotomous, radiculose; leaves erecto-patent, rigid, lanceolato-subulate, convolute, suddenly terminating in a white bristly point; nerve very broad; fertile flowers aggregate. (TAB. XL.)

Campylopus longipilus *Bridel*, Bryol. Univ. i. 477. *Bruch and Schimper*, Bryol. Eur. fasc. 41. p. 6. t. 5.

Dicranum longipilum *C. Müller*, Syn. Musc.

Dicranum flexuosum γ. piliferum *Turner*, Musc. Hib. p. 74. t. 5. f. 2. (partly).

D. flexuosum β. atrovirens *Hook. and Tayl.* (partly).

Hab. On wet rocks, and in marshy places on the mountains. Ireland, Scotland, Wales. Fr. ?

Stems 2 inches or more in height, growing in dense lurid-green hoary tufts, rigid, rather brittle. Leaves erect and straight when dry, crowded, convolute, so that the two sides overlap, rather obtuse and cucullate at the apex of the pagina where it is suddenly terminated by a white denticulate deciduous bristle-point; the nerve very broad at the base of the leaf, but ill defined, gradually narrower upwards; areolæ oblong and narrow, dense, somewhat enlarged at the base. Perichætial leaves longer and wider, with very long white bristle-points.

All the specimens in *Herb. Turner*, with fruit, belong to a lurid state of *C. flexuosus*. The specimen under this name, with fruit, from Mr. Turner (in *Herb. Hooker*), belongs to *Dicranum Scottianum;* and a lurid state of that moss appears to have been confounded with *Campylopus longipilus*, from the remark in *Fl. Hib.* p. 76., there being no such close resemblance between the ordinary forms of the two species as is there reported to exist. We conclude, therefore, that *Campylopus longipilus* has never been seen with fruit in Ireland. The Dillenian figure, above cited, refers to a moss which is erroneously described, as to the capsules, which are extraneous, and probably belong either to *Sphagnum*, or to some species of *Splachnum.*

Campylopus longipilus differs from all the preceding species in the convolute bristle-pointed leaves, mostly cucullate at the apex; but a variety is found in Wales with the leaves narrower, not convolute, and gradually tapering into a short white bristly point. This may possibly be the barren European *C. atrovirens* of De Notaris and of Bruch and Schimper; but if so, it differs from the Brazilian moss with fruit, referred to the same species in *Bryologia Europæa*, and we cannot venture to introduce it here as a distinct species.

7. 6. *Campylopus brevipilus* Bruch and Schimper (*compact Swan-neck Moss*); stems cæspitose, elongated, dichotomous; leaves lanceolate-acuminate, the upper ones with recurved margins; nerve narrow. (Tab. XL.)

C. brevipilus *Bruch and Schimper*, Bryol. Eur. fasc. 41. p. 7. t. 4.

Dicranum brevipilum *C. Müller*, Syn. Musc.

Hab Prestwick Carr, Northumberland, 1813, *Mr. Thornhill*, in Herb. Turner. Fr. unknown.

Stems 1½ inch long, slender, fragile, densely tufted. Leaves slightly spreading, shorter and wider than in any of the preceding species, the uppermost shortly hair-pointed; nerve about one-fourth of the breadth of the leaf, slightly furrowed at the back, yellowish-green when young, dark brown when old.

Distinguished from all the other species by the recurved margins of the upper leaves; also different in habit; hence its generic place is doubtful.

Suborder VII. POTTIEÆ.

21. POTTIA *Ehrh.*

Gymnostomum *Hook & Tayl.* (partly).

Stems annual, or biennial, loosely cæspitose or gregarious, growing upon newly exposed soil, occasionally upon walls in lowland districts; dichotomously branched, with long branched radicles at the base only, innovations from the base of the fertile flower.

Leaves generally in 5 series (disp. $\frac{2}{5}$), in one species they are in 8 rows (disp. $\frac{3}{8}$), semiamplexicaul, spreading, when dry suberect, and somewhat twisted, lower ones distant, upper ones crowded into a tuft, ovate-oblong, or obovate-lanceolate, rather broad, concave, entire; *nerve* excurrent, forming a mucro or arista, sometimes lamellated on the upper side of the leaf; *areolation* quadrate or rectangular; *lower cellules* enlarged.

Inflorescence monoicous; *flowers* usually separated, rarely synoicous. *Barren flower* near the *fertile*, sometimes with a single floral leaf, or with quite naked axillary antheridia, sometimes gemmiform, with three leaves; *antheridia* two or three together, oblong, with very short pedicels; *paraphyses* either wanting, or present and subclavato-filiform. *Fert. flower* larger, 3-leaved, involucral leaves similar to the upper stem-leaves; *archegonia* 3—5, with moderately long styles, and few or no paraphyses.

Fruit either solitary, or rarely two or three together. *Fruit-stalks* erect, tough, varying in length, sometimes not rising above the leaves, either suddenly dilated into the capsule, or forming a spurious apophysis. *Capsule* either exserted, or (in one species) immersed, roundish, obovate-truncate, or oval-oblong, erect, its walls thin and submembranaceous. *Annulus* either wanting, or simple and persistent. *Peristome* none. *Calyptra* cucullate, smooth or roughish at the apex, remaining until the fruit ripens. *Lid* conico-convex below, or flattish, with an oblique beak. *Sporangium* in contact with the wall of the capsule, its upper edge forming the rudiment of an internal peristome. *Apex of the columella* completely filling up the operculum, and falling away with it. *Spores* rather large, granular. *Vaginula* oblong-conical, solid. No proper perichætial leaves.

The genus *Pottia*, in commemoration of Professor Pott of Brunswick, may be considered as a section or subgenus of *Anacalypta*, from which it differs merely in the absence of a peristome. These two genera constitute the natural family of *Pottiaceæ*, which is allied to the *Trichostomeæ* through the genus *Desmatodon*.

A. Leaves piliferous, nerve lamellated on the upper side.

88. 1. *Pottia cavifolia* Ehrh. (*oval-leaved Pottia*); stems cæspitose, annual or biennial, very short and simple, or longer and dichotomously branched; leaves erecto-patent, concave, slightly imbricated, obovate or elliptical, more or less piliferous; capsule oval, on a short pedicel; lid obliquely rostrate, shorter than the capsule. (TAB. VII.)

P. cavifolia *Ehrh.* Beitrage. *Br. and Sch.* Monog. p. 7. t. 2.

Gymnostomum ovatum *Hedw.* St. Cr. t. 6. *Smith*, Eng. Bot. t. 1889. *Turner. Schwaegr. Röhl. Web. and Mohr. Nees and Hornsch.* Bryol. Germ. t. 9. f. 5. *Bridel. Hooker and Taylor. Hartm.*

var. β., stem short; leaves somewhat acuminated, scarcely piliferous.

Gymn. ovatum δ. epilosum *Bridel*, Bryol. Univ.

var. γ., leaves with long hair-like points.

Gymn. ovatum γ. incanum *Nees and Hornsch.* Bryol. Germ. i. p. 130.

var. δ. *gracilis;* stem longer, leaves more lax, capsule oblong, on a longer pedicel.

Gymn. ovatum β. gracile *Hook. and Tayl.*

Hab. Banks and mudwalls. Fr. March.

This is a species which varies remarkably, even in the same locality, in the length of the leaves, fruitstalk, and capsule; the different forms growing not promiscuously, but in separate groups, some with fruitstalks above ½ inch long, others scarcely a line in length, and the leaves equally variable, so that an observer is not easily persuaded to consider them to belong to one species. It may always be known by the concave leaves, bearing on the upper side 3 or 4 membranous appendages attached to the nerve. These, according to Bruch and Schimper, are at first two utricles containing loose masses of chlorophyll. They are analogous to the lamellæ of *Polytrichum hercynicum* and the allied species. The leaves are sometimes destitute of hairy points. The var. δ., in its extreme state, might easily be mistaken for a species of *Tortula.*

B. Leaves destitute of lamellæ, nerve more or less excurrent.

a. Leaves quinquefarious.

9. 2. *Pottia minutula* Br. and Sch. (*dwarf Pottia*); stems very short, gregarious, annual; leaves spreading, slightly recurved, ovato- or oblong-lanceolate, with recurved margins, nerve excurrent; capsule small, ovato-truncate; lid rather large, conical. (TAB. VII.)

Bryol. Europ. Monogr. p. 8. t. 3.

Gymnostomum minutulum *Schwaegr.* Suppl. t. 9. *Nees and Hornsch.* Bryol. Germ. t. 9. f. 2. *Kaulf. Bridel.*

G. Davallianum *Konig.* Ann. Bot. 1. 577., according to Smith in Herb. Turn.

var. β. *rufescens;* leaves narrower, reddish.

Gymnost. rufescens *Nees and Hornsch.* Bryol. Germ. t. 9. f. 1. *Bridel.*

var. γ. *conica;* leaves ovato-lanceolate, with a short mucro, capsule narrower at the mouth.

Gymnost. conicum *Schwaegr.* Suppl. t. 9. *Nees and*

Hornsch. Bryol. Germ. t. 9. f. 4. *Bridel. Hook. and Tayl.* Suppl. Eng. Bot. t. 2676.

G. brevicaule *Taylor*, in Lond. Journ. Bot. 1846, vol. 5. p. 42. ?

var. γγ. *oblonga;* capsule oblong, subcylindrical.

Hab. In fallow fields, especially in argillaceous soil.

Fr. Winter and Spring.

Stems very short, seldom 1 line in length, gregarious. Leaves carinate, loosely imbricated, erect when dry, somewhat acuminate, or tapering at the point, margin reflexed, nerve slightly excurrent. Capsule semi-oval or truncato-ovate, with a wide mouth, chestnut-coloured, on a reddish pedicel 1—2 lines in length. Lid widely conical, scarcely rostellate, rather shorter than the capsule. Calyptra roughish at the apex. Spores rather large. Barren flowers in the axils of the upper leaves of the fertile stem, gemmiform, small, 2 or 3 leaved; antheridia with few or no paraphyses.

A smaller species than the next. The foliage often reddish. The var. γ. is more common in Britain than the typical form, and is so exceedingly like *Anacalypta Starkeana β. brachyodus*, that we cannot determine the boundary between them, if indeed they be specifically distinct. The rudiment of a peristome exists almost always in a state of greater or less development, and they can scarcely be distinguished by any other character. Hence this species forms a closely connecting link between the two genera of *Pottiaceæ.*

G. Davallianum, mentioned in *Eng. Bot.* t. 1582., according to a specimen in *Herb. Turn.*, from Smith, appears to be a variety of *Pottia minutula* with elongated leaves, and not *Brachyodus trichodes*, as supposed by Bridel, *Bryol. Univ.* i. 58.

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3. *Pottia truncata* Br. and Sch. (*common Pottia*); leaves more or less spreading, obovate-acuminate, or oblong-lanceolate; nerve slightly excurrent; capsule truncato-obovate, wide-mouthed; lid obliquely rostrate, convex at the base. (TAB. VII.)

Bryol. Europ. Monogr. p. 9. t. 4. 5.

P. eustoma *C. Müller*, Syn. Musc.

P. eustoma β. minor *Ehrh.*

Gymnostomum truncatum *Hedw.* St. Cr. t. 5. *Nees and Hornsch*, Bryol. Germ. t. 9. f. 8. *Röhl. Web and Mohr* (β. minus).

G. truncatulum *Hoffm. Turner. Smith*, Eng. Bot. t. 1975. *Hook. and Tayl. Hartm. Dill.* Musc. t. 45. f. 7. F—K.

Bryum truncatulum *Linn.*

var. β. *major;* capsule oval-oblong, truncate, stem taller. (TAB. VII.)

Pottia eustoma α. major *Ehrh.*

Gymnost. truncatulum, var. β. *Hook. and Tayl.*

G. intermedium *Turner,* Musc. Hib. t. 1. f. a. *Smith*, Eng. Bot. t. 1976. *Nees and Hornsch.* t. 9. f. 7. *Schwaegr.* Suppl. t. 7. *Bridel.*

var. γ. subcylindrica; leaves ovato-lanceolate; the nerve more excurrent; capsule subcylindrical.

Hab. On newly exposed soil in fallows, on banks, &c.
Fr. Feb. March.

Stems from ½ line to ½ inch long, gregarious, simple or branched. Leaves widely lanceolate, oblong, often wider above the middle, acuminate, the margin reflexed, nerve mostly subexcurrent, sometimes ceasing below the apex. Capsules sometimes 2 or 3 together, mostly solitary, sometimes very short and wide-mouthed, sometimes oblong and truncate. Fruitstalk 2 or 3 lines long. Calyptra smooth, dimidiate, reddish-brown. Spores rather large, smooth, reddish-brown. Barren flowers gemmiform and axillary, as in the preceding species.

A variety sometimes occurs, in wet seasons, with the stem branched in a fasciculated manner, with 6 or 8 branches, each bearing a capsule.

b. Leaves octofarious, aristate.

4. *Pottia Wilsoni* Br. and Sch. (*oval-fruited Pottia*); stems tufted, scarcely branched; leaves octofarious, obovate-oblong, obtuse, mucronate, opaque; nerve excurrent; capsule elliptic-oblong, contracted at the mouth; lid obliquely rostrate; calyptra rough at the apex; spores smaller. (Tab. XLI.)

Bryol. Europ. Monogr. p. 11. t. 6.

Gymnostomum Wilsoni *Hooker* in Bot. Miscel. 1830, vol. 1. p. 43. t. 41.; and Eng. Fl. vol. 5. p. 8. *Suppl. Eng. Bot.* t. 2710. *Dill.* Musc. t. 45. A—K.

Hab. On banks in a sandy soil, near Over, in Cheshire, with *P. truncata var. β.* Rocky ground near Bangor, and Carnarvon; also near Llanfaelog and Holyhead, in North Wales, *W. Wilson.* It has also been found, long ago, in Sussex, by *Mr. Borrer,* and near Wrexham, by the late *J. E. Bowman.* Probably not unfrequent, and liable to be mistaken either for *P. cavifolia,* or for *P. truncata.* Fr. Feb.

Stems growing in close round convex tufts, of a pale glaucous green colour; not in extended flat patches like those of *P. truncata β*, occurring in the same situations, with foliage of a dark green colour. Leaves octofarious (not quinquefarious as in *P. truncata*), spreading, crowded, imbricated when dry, obtuse, the margin more distinctly recurved; nerve excurrent, forming a mucro in length equal to half the width of the leaf; areolation opaque and small in the upper part of the leaf, larger and diaphanous in the lower part. Antheridia naked, axillary, with filiform paraphyses. Spores small, yellowish, twice as small as in *P. truncata.*

This species ripens its fruit a month earlier than the preceding, and is easily known by its elliptical capsule, scabrous calyptra, and opaque octofarious leaves. The inflorescence also is different.

5. *Pottia crinita* Wilson (*bristly Pottia*); stems closely tufted; leaves obovate-oblong, very obtuse, octofarious; nerve strong, rigid, excurrent into a very long bristly point; capsule

elliptic-oblong, scarcely contracted at the mouth; calyptra smooth. (TAB. XLI.)

Pottia crinita *Bryol. Eur.* fasc. 42. t. 1.
Gymnostomum Wilsoni *Hooker* in Bot. Miscel. (ex parte).

Hab. Near Forfar, 1802, *Mr. G. Donn* (Herb. Turn.). East coast of Angusshire, between Montrose and Redhead, 1827—1828, also on the coast of Fifeshire, *Thomas Drummond.* Near Aberdeen, *Dr. G. Dickie.* Coast of Cornwall, *Mr. A. Greenwood.* Near Torquay, *Miss Griffiths.* Guernsey, *Rev. T. Salwey.* Probably not unfrequent in rocky places, and moist banks on the sea coast. Fr. Feb.

This species resembles the last, but has the stems more densely and compactly tufted, leaves more obovate and obtuse, almost spathulate, with a stronger nerve, forming a rigid, flexuous, bristly point twice or thrice as long as in *P. Wilsoni*; they contract less by drying, and are scarcely opaque, the areolæ larger, almost as in *P. truncata*, with which it agrees in the smooth calyptra, but not in the inflorescence, having naked axillary antheridia; the spores, too, are nearly the same in size and colour.

Mr. G. Don sent this moss, in 1802, to Mr. Turner, as probably new; but Schwaegrichen, to whom it was submitted, pronounced it to be " *Gymnost. truncatum* foliis densis."

C. Leaves serrulate at the apex, nerve not excurrent, inflorescence polygamous.

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6. *Pottia Heimii* Br. and Sch. (*lance-leaved Pottia*); stems cæspitose, somewhat branched, bi-triennial; leaves spreading, oblong-lanceolate, denticulate or serrated at the apex, margin plane; nerve ceasing at or below the point; capsule truncato-obovate or oblong; lid obliquely rostrate, adhering to the columella. (TAB. VII.)

Bryol. Europ. Monogr. p. 12. t. 7.
Gymnostomum Heimii *Hedw.* St. Cr. t. 30.? *Turner. Smith*, Eng. Bot. t. 1951. *Hooker and Taylor. Bridel. Web and Mohr.*
G. Heimii and affine *Nees and Hornsch*, Bryol. Germ. t. 9. f. 8, 9.
G. systylium *Funk MS.*
G. obtusum *Turn.* Musc. Hib. t. 1. *Hedwig*, Sp. Musc. t. 2. f. 1. 3. *Smith*, Eng. Bot. t. 1407. *Schwaegr.*

var. β. cylindrica ; leaves narrower, thinner; capsule narrower, cylindrical; lid with a longer beak.

Hab. Moist banks, &c., near the sea. Fr. April, May.

Stems more or less branched, taller than the preceding species. Leaves lanceolate, often distinctly serrulate at the acute apex, concave, not recurved in the margin; nerve reddish, scarcely at all excurrent. Inflorescence polygamous; flowers frequently synoicous, sometimes entirely barren, and then destitute of paraphyses; when the two organs are united in the same flower, they are accompanied by subclavate paraphyses, longer than the antheridia. Fruitstalk ½—1 inch long, sometimes shorter. Capsule erect, obovate or oblong, truncate, not at all contracted at the mouth, reddish-brown. Lid plano-convex at the base, with an oblique beak varying in length, remaining attached to the columella for some time after the period of maturity, as in *Systylium*, and in some other mosses. Calyptra and spores almost as in *P. truncata.*

This species varies, like *P. truncata*, in size; in the direction, size, and shape of the leaves; and in the length of the capsule and lid. *Gymnostomum obtusum* Eng. Bot. t. 1407., is only a dwarf state of the species, with the capsule and fruitstalk shorter than usual, and the leaves almost entire at the apex. The figure was taken from specimens given by Mr. Turner; but Mr. Teesdale's specimens, which are attached to the original drawing, do not belong to this species, having the leaves elliptic-oblong, entire, their margins recurved, and the nerve decidedly excurrent and very strong. Another variety, found near Dublin, in May 1803, by Mr. Mackay, has very broad concave leaves, with the fruit as in *G. obtusum.* Several forms of this species are given in Drummond's *Musci Americani*, one of which has the leaves pale-margined, and the capsule cylindrical.

Bryum obtusum of Dickson (*Gymnostomum obtusum* Hedw. *Sp. Musc.* t. 2.) is *Entosthodon Templetoni*, according to a specimen in Mr. Turner's *Herbarium. Gymnostomum Heimii*, from Dr. Hedwig, in *Herb.* Turner, certainly belongs to *Pottia truncata.*

22. ANACALYPTA *Röhling.*

POTTIA (Sect. I.) *C. Müller*, Syn. Musc.

WEISSIA *Hook. and Tayl.* (partly).

Habit, mode of growth, and fruit, as in *Pottia,* with which it also agrees in the form and structure of the leaves, and in the inflorescence.

Capsule oval, on a straight elongated pedicel. *Lid* conical, or obliquely rostellate. *Calyptra* cucullate. *Annulus* narrow, subpersistent. *Peristome* single; *teeth* 16, united at the base by a narrow membrane, plane, lanceolate, entire, or imperfectly divided into two portions, or perforated, occasionally incomplete, or fragmentary, without a medial line. *Spores* rather small.

It is questionable whether *Anacalypta* and *Pottia* should not be regarded as sections of one genus, differing, as they do, merely in the presence or absence of a peristome, and perhaps already connected by different forms of one species under the several names of *Pottia minutula* and *Anacalypta Starkeana.* Name from *ανα, above,* and *καλυπτος, covered,* with the calyptra.

1. *Anacalypta Starkeana* Nees and Hornsch (*Starke's Anacalypta*); stems very short, gregarious, annual; leaves spreading, ovato- and oval-lanceolate, margin recurved, entire; nerve

slightly excurrent; capsule small, oval; lid conical, obtuse; teeth of the peristome obtuse, without a medial line, more or less perforated. (TAB. XIV.)

A. Starkeana *Nees and Hornsch.*, Bryol. Germ. t. 36. f. 2. *Br. and Sch.* Monogr. p. 2. t. 1.

Pottia Starkeana *C. Müller*, Syn. Musc.

Weissia Starkeana *Hedw.* St. Cr. t. 34. *Schwaegr. Bridel. Hooker and Taylor.*

Grimmia Starkeana *Smith*, Fl. Brit. *Eng. Bot.* t. 1490. *Web and Mohr. Kaulf.* in Sturm. Fl. Germ. (not of *Turner*, Musc. Hib. p. 26., which is *Tortula unguiculata* var.)

Bryum minutum *Dickson.*

var. β. brachyodus; capsule narrower; teeth of the peristome very short, truncate.

Weissia affinis *Hook. and Taylor,* Musc. Brit. ed. 2. (TAB. XIV.)

Hab. Banks and fields, in the middle and South of Britain. Near Dublin and Cork, Ireland. Coast of Anglesey. Very rare in Lancashire. Fr. Jan. Feb.

Stems very short, often growing in a scattered manner, less than 1 line in length. Leaves spreading, lower ones ovate-acuminate, upper ones oval, or oblong-acuminate, or lanceolate, larger, carinato-concave, margin recurved, the reddish nerve forming a short mucro at the apex, seldom discontinued below it; areolæ small above, larger at the base. Capsule chestnut-brown, shining, its walls rather thin. Annulus persistent. Peristome very variable in form and colour, the teeth seldom bifid at the apex, partly cribrose or entire, slightly oblique, as in the next, lanceolate, obtuse, with distant transverse bars, pale red or yellowish, erect when dry. Spores smoothish. Barren flowers axillary, mostly leafless, or rarely with a single involucral leaf.

According to Bruch and Schimper, this species is easily distinguished from *Pottia minutula* by its capsule "plus alongée de couleur roux-ferrugineux plus clair," and by the leaves "d'un verd foncé ou jaunâtre." We ourselves dare not pronounce them distinct, after having examined numberless intermediate forms, which pass insensibly from the var. β. of this species to *Pottia minutula* γ.

The var. β. is frequent on the coast of Sussex and Durham, also near Dublin, and on the S. W. coast of Anglesey, and is commonly mistaken for *Gymnost. conicum* Hook. and Tayl.

95. 2. *Anacalypta cæspitosa* Bruch (*round-fruited Anacalypta*); stems very short, subcæspitose, scarcely branched; leaves spreading, ovate, or oblong-lanceolate, concave, margin plane; nerve slightly excurrent; perichætial leaves sheathing; capsule ovate; lid with a long beak; annulus simple; teeth of the peristome more or less perfect, perforated, or obsoletely fissile. (TAB. XLI.)

A. cæspitosa *Bruch* in litt. *Nees and Hornsh.* Bryol. Germ. t. 37. f. 4. *Bruch and Schimp.* Monogr. p. 3. t. 2.

Pottia cæspitosa *C. Müller,* Syn. Musc.

Hab. On chalk hills. Woolsonbury Hill, near Hurst Pierpoint, Sussex, March 1846, *Mr. Mitten.* Fr. March.

About the same size as the preceding species, and easily distinguished by the ovate capsule of a yellowish brown colour, yellowish fruitstalk, rostrate lid, and plane-margined leaves. There is also a distinct perichætium, the inner perichætial leaf very broad and sheathing. Annulus yellowish. Barren flower gemmiform; antheridia with paraphyses.

3. *Anacalypta lanceolata* Röhl. (*lance-leaved Anacalypta*); stems subcæspitose, biennial, simple, or dichotomously branched; leaves more or less spreading, ovato-lanceolate, or oval-oblong, acute, margin recurved; nerve excurrent into a rather long mucro, carinato-concave, entire; capsule oval, tapering at the base; lid more or less rostrate, conico-convex at the base; annulus simple; teeth of the peristome rather long, with a medial line, often perforated along the middle. (TAB. XIV.)

A. lanceolata *Röhling,* Moosgeschiste Deutshl. *Nees and Hornsch.* Bryol. Germ. t. 36. f. 3. *Br. and Sch.* Monogr. p. 4. t. 2.
Pottia lanceolata *C. Müller,* Syn. Musc.
Leersia lanceolata *Hedw.* Sp. Musc.
Encalypta lanceolata *Turn.* Musc. Hib. *Hedw.* Sp. Musc. *Schwaegr.*
Grimmia lanceolata *Smith,* Eng. Bot. t. 1408.
G. lanceolata and aciphylla *Web and Mohr.*
Weissia lanceolata *Hook. and Tayl.* tab. xiv.
Coscinodon lanceolatus, aciphyllus, and connatus, *Bridel.*
Bryum lanceolatum *Dickson.*
Dicranum latifolium *Turner,* Musc. Hib. *Smith* (not of *Hedw.*)

var. β. angustata; capsule more slender; teeth of the peristome imperfect.
Entosthymenium mucronifolium *Müller,* in Regensb. Bot. Zeit. 1829.

Hab. On moist banks in calcareous soil, walls, calcareous rocks, &c. Fr. March.

Growing in more or less extensive incoherent patches. Stems from 1 line to ½ inch long. Leaves gradually larger towards the top of the stem, generally oval-oblong, acuminate, carinato-concave, margin revolute or recurved, nerve more or less excurrent, colour light or yellowish-green. Capsule on a rather long reddish pedicel, erect, oval or oval-oblong, its walls rather thick, chestnut-coloured, glossy, and somewhat contracted below the mouth when dry. Lid obliquely rostrate, the beak longer or shorter. Annulus simple, dehiscing in fragments. Teeth of the peristome very variable; sometimes almost linear, and moniliform, with 5 or 6 internodes; sometimes shorter and lanceolate, obtuse; sometimes longer, linear-lanceolate, rather acute, formed of a double row of cellules, here and there perforated along the medial line, flattish, minutely papillose, somewhat jointed, usually of a pale reddish fawn colour, sometimes red, suberect when dry, or slightly incurved at the apex; somewhat oblique, and always connected below by a common membrane. Calyptra reaching above half-way down the capsule, yellowish-brown, remaining until the fruit is ripe. Spores rather small. Barren flower gemmiform, axillary; antheridia with short paraphyses.

This is a larger species than either of the preceding, and very much resembles *Pottia truncata* var. β. It is also not unlike *Desmatodon latifolius*, for which it has been mistaken by Smith and Turner, but has the capsule elliptical, not truncate and cylindrical. The var. β. is not found in Britain; it has smaller, and proportionably wider leaves, with a shorter mucro.

A curious variety of *A. lanceolata* has been once found near Bristol, by Mr. Thwaites, with the teeth of the peristome red, widely spreading when dry, almost free at the broad base, thence tapering upwards to a narrow point, and unusually long, sometimes with two lines of perforations. It is extremely like *Desmatodon Guepini* Br. and Sch., except that the teeth are not distinctly bifid, and the capsule is roundish-elliptical.

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4. *Anacalypta latifolia* Nees and Hornsch. (*bulb-leaved Anacalypta*); stems gregarious, bulb-like, very short, scarcely branched; leaves imbricated, widely obovate, or roundish-ovate, apiculate or obtuse, glossy, concave; the nerve ceasing just below the apex; capsule oval-oblong, with an annulus; lid with a short beak; teeth of the peristome lanceolate, entire, or cloven half-way down, united at the base by a narrow membrane. (TAB. XXXIII.)

A. latifolia *Bryol. Germ.* t. 36. f. 1. *Br. and Sch.* Monogr. p. 5. t. 4.
Weissia latifolia *Schwaegr.* Suppl. t. 28. *Bridel. Greville*, Scot. Crypt. Fl. t. 149. *Hook. and Tayl.*
Grimmia latifolia *Web. and Mohr.*
Pottia latifolia *C. Müller*, Syn. Musc.

var. β. pilifera; leaves with hair-like points.

Anacalypta latifolia β. pilifera *Nees and Hornsch.* Bryol. Germ. t. 36. f. 1. β.
Trichostomum piliferum *Smith*, Eng. Bot. t. 2535.
Coscinodon pilifer *Bridel.*
Dicranum bullatum *Sommerfelt.*
Bryum piliferum *Dickson*, Crypt. fasc. 4. t. 10. f. 14. (in Herb. Turner).

Hab. Clova Mountains, Scotland. In the crevices of rocks, with *Didymodon glaucescens* and *Oxytropis campestris*, in Glen Phee, or Glen Dole; rare: *Mr. Drummond*, Sept. 1824. var. β. on shady banks near Aberfeldy, *Mr. Dickson*.

Fr. Spring.

Plants bi-triennial, remarkable for the bulb-like clustered foliage, of an almost silvery hue. Leaves crowded, imbricated, roundish, lower ones obtuse, upper ones apiculate, very concave, not recurved in the margin, membranous, shining and whitish. Capsule erect. Lid half as long. Calyptra reaching half-way down. Annulus subpersistent. Teeth of the peristome rather short, pale or reddish, recurved when dry. Spores rather large.

This very singular and elegant species is quite alpine, and is found in several places in Switzerland. The var. β. as British, rests, like *Tortula agraria* (*T. stellata* Hook. and Tayl.), entirely on Mr. Dickson's authority. The figure in *Eng. Bot.* appears to us almost unexceptionable, even if it were not a strong corroboration of the figure previously given by Dickson himself; and we concur with Smith in the opinion that it is different from *Dicranum latifolium* of Hedwig, although the exserted columella and rather short lid, expressed in the figure, agree best with that species.

SUBORDER. VIII. TRICHOSTOMEÆ.

23. DESMATODON *Bridel.*

DICRANUM and DIDYMODON *Hook. and Tayl.* (partly).

In habit, mode of growth, and in the structure of the peristome, this genus is allied, on the one hand, to *Trichostomum*, and, on the other, to *Anacalypta*, thus connecting the *Trichostomeæ* with the *Pottieæ.*

Plants perennial, growing in small tufts, dichotomously branched with innovations, which arise in pairs from below the fertile flower, of rather low stature, putting forth radicles throughout the entire length of the stem.

Leaves octofarious, upper ones the largest, and collected into a terminal bunch, broad, oblong-lanceolate, nerved; *nerve* mostly excurrent, margin entire, papillose on one or both sides; *areolæ* in the upper portion of the leaf closely hexagonal or roundish, elongated and larger below.

Inflorescence monoicous. *Barren flower* gemmiform, sometimes terminal, sometimes lateral, or axillary, and in proximity to the fertile flower, 2 or 3-leaved, rarely 1-leaved; *antheridia* 3—10, shortly pedicellate, with subclavate paraphyses. *Fertile flower* gemmiform, the involucral leaves similar to the contiguous ones; never changed into a close sheathing perichætium; *archegonia* mostly without paraphyses.

Capsule on a straight or arcuate pedicel, erect, or cernuous, or pendulous, oval, oblong, or oblong-cylindrical, with a short neck. *Calyptra* cucullate, rather long. *Lid* bluntly rostrate. *Annulus* simple. *Peristome* single; *teeth* 16, subulate, united at the base by a common membrane, bi-trifid, sometimes as in *Trichostomum*, apparently consisting of 32 unequal processes, which are four-angled, remotely barred, granulose, and either wholly free, or connected together by trabeculæ; erect when moist, incurved when dry, and slightly convolute towards the left, somewhat hygroscopic. The *columella* projects beyond the mouth of the ripe capsule.

In the form of the leaves and capsule this genus approaches the *Cuneifoliæ* section of *Tortula.* Eight species are described in the *Bryologia Europæa*, of which only two are found in Britain. Name from *δεσμα, ατος, a band;* and *οδων, tooth.*

C. Müller (Syn. Musc.) considers *Desmatodon* to be a section of *Trichostomum*, and we retain it only in deference to the authors of *Bryol. Europ.*

98. 1. *Desmatodon latifolius* Bridel (*broad-leaved Desmatodon*); leaves oblong-lanceolate, acuminate, mucronate, concave; margin revolute; nerve excurrent; capsule subcylindrical, oblong, truncate; lid with a short oblique blunt beak; annulus small; calyptra twice as long as the capsule. (TAB. XVI.)

D. latifolius *Bridel*, Br. Univ. *Bruch and Schimp.* Monogr. p. 5. t. 1.
D. brevicaulis *Bridel.*
D. apiculatus *Arnott*, Disp. Meth.
Dicranum latifolium *Hedw.* St. Cr. 1. t. 33. *Turner?* *Smith* in Eng. Bot. t. 2492. (figured from foreign specimens). *Web. and Mohr.* Bot. Tasch. t. 7. f. 14. *Hook. and Tayl.*
Trichostomum latifolium *Schwaegr. C. Müller*, Syn. Musc.

var. β. muticus; stem taller, more slender and more branched; leaves muticous; the nerve ceasing below the apex.

D. latifolius β. muticus *Bridel.*
D. glacialis *Funk.*

Hab. On the ground in subalpine situations; *var. β.* in alpine places. Said to have been found in Scotland, and in Ireland. A very doubtful native. Fr. Summer.

The evidence in favour of this moss, as a Scottish or Irish species, is quite unsatisfactory. The Irish specimen from Dr. Scott, in Mr. Turner's *Herbarium*, on the authority of which this species was admitted into *Turn. Musc. Hib.*, is a solitary stem, with an old capsule and broken peristome, and certainly belongs to *Tortula muralis;* it is fastened on the same sheet with *Bryum piliferum* of Dickson (*Anacalypta latifolia β.*), and the true *D. latifolius* (given by Dr. Smith from the Linnæan *Herbarium*), from which the *Eng. Bot.* figure was certainly taken, and not from Irish specimens. On another sheet, along with *D. latifolius β.* from Dr. Swartz, there is a solitary stem of the same variety, marked "from Miss Hutchins, *Herbarium*," which appears to have once formed a portion of Dr. Swartz's specimens. The habitat given by the late Dr. Taylor, "4 miles from Dublin, on the road to Luttrelstown," belongs certainly to *Anacalypta lanceolata*, as is proved by a portion of the original specimen inserted in a copy of *Musc. Brit.* ed. 1., given by Dr. Taylor to Mr. Spruce, in 1842, though there is none remaining in Dr. Taylor's *Herbarium.*

Desmatodon latifolius differs from *Anacalypta lanceolata* in the cylindrical truncated yellowish-brown capsule, exserted columella, short lid, longer yellowish pedicel, and more oblong papillose leaves. The teeth of the peristome, too, are more tapering, generally cloven almost to the basilar membrane, the two portions not connected by trabeculæ.

Desmatodon systylius of *Bryol. Europ.* fasc. 31. is intermediate in aspect between *D. latifolius* and *Anacalypta latifolia β. pilifera*, for which it has been mistaken in Drummond's *Musci Americani*, No. 70. It is known by the adhesion of the lid to the columella of the fully ripe capsule, and the leaves are less concave and more elongated than those of *A. latifolia*.

2. *Desmatodon nervosus* Br. and Sch. (*thick-ribbed Desmatodon*); stems pulvinato-cæspitose, dichotomously branched; leaves spreading, contorted when dry, oval-oblong, apiculate; the nerve strong, thickened above and slightly excurrent, concave, revolute in the margin; capsule oval, without an annulus; lid obliquely rostellate; teeth of the peristome unequal. (Tab. XX.)

Bryol. Europ. Monogr. p. 6. t. 3.
G. atrovirens *Eng. Bot.* t. 2015. (not of *Turner*, according to his Herbarium.)
Didymodon nervosus *Hook. and Tayl. Bridel*, Bryol. Univ.
Trichostomum convolutum *Brid.* Br. Univ. *C. Müller*, Syn. Musc.
Tortula parvula *Hook. and Grev.* Brewst. Edin. Journ. Sc. vol. i. p. 302. t. 12. ?
Tortula recurvata *Hook.* Musc. Exot. t. 130. ?
Barbula crassinervia *Taylor* in Lond. Journ. Bot. Jan. 1846, vol. v. p. 51. ?

var. β. edentulus; lid conical, shortish; peristome rudimentary or wanting.

Hab. On dry banks, walls, &c., in maritime situations.
Fr. March.

Stems about ¼ inch long, slightly branched, rather densely tufted. Leaves moderately spreading, concave, somewhat spirally twisted round the stem when dry, firm, revolute in the margin; the nerve very strong, gradually thickened, and of somewhat spongy texture in the upper part, slightly excurrent, forming a small mucro; areolæ small and roundish above, large, rectangular, and diaphanous below. Fruitstalk 3—5 lines in length, rather rigid, reddish. Capsule oval, or oval-oblong, regular, reddish-brown. Lid about half the length of the capsule, conical, with a short beak. Teeth of the peristome variable in length, connected in pairs by a common basilar membrane, erect or slightly oblique, reddish and of granular texture, almost obliterated in the var. β. Barren fl. gemmiform.

This moss may be identified by the remarkable incrassated spongy nerve (analogous to that of *Tortula revoluta*), and by the firm sub-elliptical concave leaves, contorted when dry. We have not fully proved that *Tortula parvula* and *T. recurvata* are varieties of this species; but a satisfactory diagnosis seems to be wanting in both cases. The peristome of *Desmatodon nervosus*, when highly developed, is scarcely, if at all, distinguishable from that of the genus *Tortula*.

Grimmia Starkeana of Turner (*Musc. Hib.* p. 26.) is a variety of *Tortula unguiculata*, so far as relates to Dr. Stokes's specimens (in a very bad state), gathered at Rathmines Bridge; but the description is partly drawn up from genuine examples of *G. Starkeana*, not then known to grow in Ireland.

24. DISTICHIUM *Br. and Sch.*

DIDYMODON *Hook. and Tayl.*

Densely cæspitose, with innovations two together, dichotomously branched and fastigiate. *Leaves* distichous, subulate. *Capsule* on a long pedicel, oval, oblong, erect or crenuous. *Lid* conical. *Calyptra* cucullate.

Stem erect, flexuose, beset with radicles, innovations from below the flower.

Leaves either quite distichous, or at the summit of the stem 3-ranked, glossy, dilated and sheathing at the base, where they overlie each other, subulato-setaceous, flexuose and spreading in the upper part; the *nerve* broad and predominant; *areolæ* minute above, roundish, abounding with chlorophyll, enlarged and diaphanous at the base.

Inflorescence monoicous. *Antheridia* either in a 2—3 leaved periginium, or naked, 2—8 together, in the axillæ of the upper cauline leaves, cylindrical, curved, on a short pedicel, more elongated than usual in allied genera. *Paraphyses* longer and filiform. *Archegonia* 3—5 together, with long styles, narrow, with short paraphyses, and 2—3 involucral leaves.

Capsule on a long slender pedicel, erect or inclined, oval-oblong or subcylindrical, with a short tapering base, reddish-brown. *Lid* shortly conical. *Calyptra* cuculliform, with a slender beak. *Annulus* spirally dehiscent, formed of two rows of cellules. *Peristome* single; *teeth* 16, inserted below the orifice of the capsule, not confluent at the base, equidistant, linear, or linear-lanceolate, transversely barred, marked with a medial line, either entire or perforated, occasionally cloven. *Spores* small, smooth.

Alpine mosses, growing usually in the crevices of moist rocks. Perennial.

The genus *Distichium* is distinguished at first sight from the other *Trichostomeæ* by the distichous leaves. Only two species are known. Name from διστιχος, *two-ranked*, in allusion to the leaves.

100. 1. *Distichium capillaceum* Br. and Sch. (*fine-leaved Distichium*); stems densely and widely cæspitose; capsule erect, ovate-oblong, or subcylindrical; teeth of the peristome narrow, with distant articulations, irregularly cloven. (TAB. XX.)

Bryol. Europ. fasc. 29, 30. Monogr. p. 4. t. 1. *C. Müller*, Syn. Musc. i. 40.
Swartzia capillacea *Hedw.* St. Cr. t. 28.
Cynontodium capillaceum *Hedw.* Sp. Musc.
Cynodontium capillaceum *Schwaegr.*

Trichostomum capillaceum *Smith*, Eng. Bot. t. 1152.
Didymodon capillaceus *Web. and Mohr. Brid. Hook. and Tayl. Hartmann.*
Bryum capillaceum *Dickson*, Crypt. fasc. 1. t. 1. f. 6.
var. β. brevifolium; smaller, more densely tufted, leaves shorter.
Didymodon distichus *Bridel.*

Hab. Scottish and Welsh Mountains, frequent. Var. β. not found in Britain. Fr. Summer.

Stems 1 or 2 inches high, or more. Capsule erect, seldom inclined, regular or curved, bright reddish-brown. Lid 5 or 6 times shorter than the capsule, conical. Annulus distinct. Teeth of the peristome either entire, or bifid along the medial line, sometimes trifid, narrow, and distant from each other. Antheridia axillary, naked.

2. *Distichium inclinatum* Br. and Sch. (*oblique-fruited Distichium*); stems subcæspitose; leaves crowded, those of the perichætium 3-ranked; capsule cernuous, oval; teeth of the peristome larger, lanceolate, nearly entire or perforated, with numerous articulations; spores larger. (Tab. XX.)

Bryol. Europ. ib. p. 5. t. 2. *C. Müller*, Syn. Musc. i. 41.
Swartzia inclinata *Hedw.* St. Cr. t. 27.
Cynodontium inclinatum *Schwaegr.*
Cynodon inclinatus *Bridel.*
Grimmia inclinata *Smith*, Eng. Bot. t. 1824. (not Bryum inclinatum *Dickson*, which is *Dicranum subulatum*).
Didymodon inclinatus *Swartz*, Musc. Suec. *Web. and Mohr. Wahlenb. Hook. and Tayl. Hartmann.*
var. β. tenue; stem and leaves shorter.

Hab. Mountain rocks, rare. Mountains of Cunnemara, Ireland, *Mr. Mackay.* Sands of Barrie, near Dundee, with *Catoscopium nigritum, G. Don, &c.* Fr. June, July.

Stems shorter than the preceding species. Leaves more crowded, narrower, with longer areolæ, colour a duller green, more evidently papillose. Capsule inclined, or almost horizontal, oval or oblong, olive-brown. Annulus broader. Teeth of the peristome larger, broader, lanceolate, bi-trifid, or nearly entire, with closer transverse bars, which are rather prominent on the outer side. Spores larger. Lid longer in proportion to the capsule. Barren flower with 1—2 or 3 leaves; antheridia sometimes 8 together.

It has already been noticed, in the 2nd edition of the *Muscologia Britannica*, that when the peristomes of these two species are submitted to the microscope, they almost seem to belong to different genera, so much narrower are the teeth of the preceding species. On the other hand, when we take into account the general agreement of the two species, it is not easy to abandon the suspicion that they may be varieties only of one species, bearing much the same relation to each other as that which subsists between *Dicranum flavescens* and *D. pellucidum.* In whatever way this question is decided, we have here one of many proofs that the peristome, taken alone, will not suffice as a basis for the formation of natural genera.

25. DIDYMODON *Br. and Sch.*

WEISSIA, DIDYMODON, and TRICHOSTOMUM, *Hook and Tayl.* (partly).

Closely allied to *Trichostomum*, in habit, form, and disposition of the leaves, and in the capsule and calyptra.

Stems dichotomously branched, fastigiate, cæspitose, rooting at the base of the innovations and of the primary stem.

Leaves lanceolate, linear-lanceolate, and ligulate, with acuminate points, carinato-concave, reflexed in the margin, rarely plane, entire, or toothed at the apex, with a roundish nerve; *cellules* dot-like above, opaque, with chlorophyll, somewhat prominent on the surface; larger, elongated, and diaphanous below.

Inflorescence monoicous, dioicous, rarely synoicous. The *flowers*, &c., as in *Trichostomum.*

Perichætium scarcely different from the upper cauline leaves; slightly sheathing at the base, and somewhat larger.

Capsule erect, on a rather long pedicel, subcylindrical, with a very short tapering base. *Lid* conical, with an oblique obtuse short beak. *Calyptra* cucullate, reaching half-way down the capsule, or more, thin and membranous. *Annulus* of one or two rows of cellules, either persistent or unrolling. *Peristome* proportionably short; *teeth* 16, linear-lanceolate, *not obviously united by a basilar membrane*, very tender and fugacious, either entire, or perforated, or bifid along the medial line, somewhat variable in size and structure. *Spores* rather small.

Growing on the ground, and on rocks, rarely on trees. Perennial. Name from διδυμος, *twin*, οδων, *tooth.*

While this genus is allied, as above-mentioned, to *Trichostomum*, it is connected with *Anacalypta* and *Desmatodon* in the structure of the peristome, with the exception that the teeth are much more tender and fugacious. Bruch and Schimper consider this genus necessary so long as the two last-named genera are kept up, and the more so because many exotic species exist having all the characters ascribed to the genus. In deference to the views expressed in *Bryol. Europ.* we here preserve the genus intact, although, with C. Müller, we should otherwise willingly merge it in the genus *Trichostomum.*

SECT. I. *Inflorescence monoicous* (synoicous *Br. and Sch.*)

102. 1. *Didymodon rubellus* Br. and Sch. (*reddish Didymodon*); leaves spreading and recurved, oblong-lanceolate, carinate, margin recurved, nerved almost to the apex, lower ones reddish; capsule cylindrical; lid shortly and obliquely rostrate; teeth of

the peristome entire or cloven along the medial line. (TAB. XIV.)

Bryol. Europ. Monogr. p. 3. t. 1.
Trichostomum rubellum *C. Müller*, Syn. Musc. i. 581.
Weissia recurvirostris *Hedw.* St. Cr. t. 7. *Bridel.*
W. curvirostra *Hook and Tayl.*
Grimmia recurvirostra *Smith*, Eng. Bot. t. 1438.
Anacalypta recurvirostris *Nees and Hornsch.* Bryol. Germ. t. 37.
Grimmia rubella *Roth.*
Bryum curvirostrum *Dicks. Dill.* Musc. t. 48. f. 45 & 46.
Barbula Salensis *Mohr. MSS.* in Herb. Turner.

Hab. On shady walls, rocks, and on the ground in a clayey or gravelly soil: not unfrequent. Fr. October.

Stems ¼—1 inch in height, slightly tufted. Leaves intense or dull green, lower ones invariably reddish (by which feature it is easily recognised), rather obtuse, when dry incurved and slightly twisted. Capsule pale brown, of thin texture, somewhat glossy. Peristome tender and fugacious, pale reddish. Annulus simple. Antheridia naked in the axils of the perichætial leaves; not often actually mixed with the archegonia. The peculiar inflorescence, together with the reddish hue of the lower leaves, serve to distinguish this moss from *Trichostomum rigidulum*, and from all others which in any degree resemble it.

SECT. II. *Inflorescence dioicous.*

A. Leaves lanceolate, rather rigid.

3. 2. *Didymodon luridus* Hornsch. (*dusky Didymodon*); stems somewhat tufted; leaves ovate-lanceolate, carinate, reflexed in the margin, appressed, straight, and erect when dry; capsule oblong or cylindrical; lid conical-acuminate; annulus narrow, persistent; teeth of the peristome small and irregular. (TAB. XLI.)

Didymodon luridus *Hornsch.* in Linn. Syst. pl. ed. Sprengel, iv. p. 173. *Bryol. Europ.* Monogr. p. 4. t. 2. (excl. Syn. Hook. and Tayl.)
Cynodon luridus *Bridel*, Bryol. Univ. Suppl. i. 818.
Tortula brevifolia *Smith?* (partly).
Bryum obtusifolium *Turner*, Musc. Hib. (partly).
Trichostomum trifarium *C. Müller*, Syn. Musc. i. 574.

Hab. On walls, chiefly of limestone; rare in Britain, or often overlooked. Near Cork, on the way to Douglas, 1829, *W. Wilson.* Kent and Sussex, *Mr. Mitten.* Yorkshire, *Mr. Spruce.* Fr. December.

Stems ¼—1 inch in height, crowded, slightly cæspitose. Leaves crowded, spreading, straight and loosely imbricated when dry; lower ones ovate-lanceolate, upper ones larger, widely lanceolate, margin recurved, entire; nerve reddish-brown, continued almost or quite to the rather acute apex; areolæ punctulate, or dot-like, roundish, rather small, colour lurid green, at length brownish. Perichætial leaves erect, rather obtuse, with a thinner and shorter nerve. Barren stems with terminal gemmiform flowers. Capsule oblong, subcylindrical, mostly regular, reddish-brown. Fruitstalk ½ inch long, twisted towards the right. Teeth of the peristome pale yellowish, smooth and pellucid, of horny brittle consistence, irregular in shape, and fugacious, sometimes bifid, distantly and faintly articulated. Spores small.

This species is not identical, as Bruch and Schimper suppose, with *Didymodon trifarius* Hook. and Tayl., which is truly *Trichostomum tophaceum* of Bruch and Schimper. From that and from *Trichostomum rigidulum*, which it also much resembles, it may be known by the erect straight dry foliage, and by the teeth of the peristome being inserted below the orifice of the capsule, without any visible basilar membrane; they have, too, a different consistence, and are perfectly smooth, not granular or papillose. Bruch and Schimper remark that *Swartzia trifaria* Hedw. (*St. Cr.* t. 28.), the figure of which in part corresponds with *Didymodon luridus*, is in other respects indeterminate. Possibly two or more species have been confounded by Hedwig, as in the case of *Orthotrichum striatum.* The principal figures correspond very nearly with a moss gathered near Upsal by Myrin, and named by him "*Didymodon trifarius* Swartz, forma intermedia," differing from any which we have elsewhere seen, and apparently a species of *Didymodon:* it is smaller in all its parts than *D. luridus;* leaves linear-lanceolate, plane, not at all reflexed in the margin, crisped when dry; capsule thin and pellucid, oval. When dry the specimens are not unlike a small state of *Weissia controversa*, but they are too few and imperfect to be fully investigated as to the nature of the inflorescence; if the flowers are really synoicous, as Hedwig states, the moss must be still more unlike any species to which authors have referred it. We may here remark that Sir J. E. Smith, in his remarks concerning *Trichostomum trifarium*, Eng. Bot. t. 1707., has incorrectly described as stamens the jointed filaments which are now called paraphyses.

B. Leaves linear-lanceolate or ligulate, flexuose.

104. 3. *Didymodon cylindricus* Br. and Sch. (*slender-fruited Didymodon*); leaves linear-lanceolate, spreading, crisped when dry, margin plane and somewhat undulated; capsule cylindrical, narrow, with a distinct annulus; lid with a slender beak; teeth of the peristome linear-lanceolate, entire, perforated or cloven. (TAB. XXXIII.)

Bryol. Europ. Monogr. p. 5. t. 3.

Weissia cylindrica *Nees and Hornsch.* Bryol. Germ. t. 29. f. 13. *Bridel.*

W. tenuirostris *Hook. and Tayl.* Musc. Brit. ed. 2. (fig. bad).

Didymodon tenuirostris *Wilson* in Lond. Journ. Bot.

Trichostomum cylindricum *C. Müller*, Syn. Musc. i. 586.

Hab. On moist shady rocks, especially near waterfalls; rare in fruit. Campsie, near Glasgow. Near Dolgelly, N. Wales.

Near Conway. Near Killarney, Ireland. County of Wicklow, *Mr. D. Moore.* Fr. October.

Stems ¼—1 inch in height, forming soft yellowish-green patches, more or less branched. Leaves spreading and flexuose, sometimes recurved, when dry crisped; lower ones lanceolate and distant; upper ones longer, linear-acuminate, slightly carinate, undulated in the margin, which is minutely granulose or crenulate; nerve subexcurrent, light green, slightly pellucid; areolæ small and opaque above, enlarged and diaphanous at the base of the leaf. Capsule on a slender yellowish pedicel, erect, pale reddish-brown, its walls thin and transparent. Lid conical at the base, rostrate, equalling about one-third of the capsule in length, also transparent. Calyptra thin and membranous, falling away with the lid. Teeth of the peristome narrow, sometimes distinctly cloven, always marked with a medial line of dehiscence, often perforated, remotely articulated, erect when moist, converging when dry, very fugacious. Spores small.

The leaves of this species approach very nearly to those of *Tortula tortuosa*, but are of more tender consistence, with a narrower nerve, and the areolæ are gradually, not suddenly, enlarged towards the base. By this character they may always be distinguished, even in a barren state. A curious variety of this moss (as we suppose it to be, but not sufficiently mature for full investigation) has been gathered by Mr. D. Moore, on moist banks in the county of Wicklow, with the leaves shorter, more rigid, much recurved when moist, and scarcely crisped when dry, approaching somewhat in aspect to *Tortula squarrosa.*

5. 4. *Didymodon flexifolius* Hook. and Tayl. (*bent-leaved Didymon*); leaves erecto-patent, oblong or ligulate, apiculate, coarsely serrated at the apex, flexuose and crisped when dry; capsule subcylindrical, slightly curved; lid shortly rostellate; teeth of the peristome very short. (TAB. XX.)

D. flexifolius *Hook. and Tayl.* Musc. Brit. *Schwaegr.* Suppl. t. 184. *Bruch and Schimper*, Monogr. p. 6. t. 4.
Trichostomum flexifolium *Smith*, Eng. Bot. t. 2493. *C. Müller*, Syn. Musc. i. 577.
Bryun flexifolium *Dickson.*

Hab. Elevated moors, on a thin rocky soil, especially where the herbage has been burned; first observed on sterile banks near Croydon by *Mr. Dickson.* Abundant on the moor two miles from Buxton, on the Manchester road, *Dr. Greville.* On Ben Ledi, and other neighbouring mountains, *Professor Walker-Arnott.* Congleton Cloud, and Alderley Edge, Cheshire; and in several similar situations in the neighbouring counties. Occurring in a barren state on the roofs of thatched barns, &c., and on hedge banks, not unfrequently. Fr. March, April.

Stems mostly under ½ inch in height, except when barren, and then from 2 to 3 inches long, soft and fragile, forming yellowish or dark green patches. Leaves spreading, apparently 3-ranked, somewhat twisted and flexuose even when moist, more twisted and crisped when dry, upper ones oblong or almost ligulate, rather obtuse, with a short point, coarsely toothed or serrated near the apex, carinate, margin plane in the upper half, recurved below, nerve ceasing below the apex, areolæ roundish; perichætial leaves larger, somewhat sheathing. Capsule rather small, seldom quite straight, reddish-brown, pale brown when fully ripe and empty, its walls thin and corrugated when dry. Fruitstalk yellowish, $\frac{1}{3}$—$\frac{1}{2}$ inch long. Lid variable in length, sometimes half as long as the capsule. Annulus small and fragmentary. Peristome variable as in *D. luridus*, but rather longer, teeth yellow, sometimes cloven, but the two crura or divisions are generally more or less connected. Calyptra as in the other species, rather long. Spores yellow, larger than in *D. luridus*. Barren-flowered plants more slender, with smaller leaves and terminal small inconspicuous gemmiform perigonia containing 7 or 8 antheridia mixed with paraphyses. Fertile plants not unfrequently bear axillary coloured ramuli, which are very easily detached, and are probably a kind of gemmæ by which the species is usually propagated; but Mr. Mitten finds a gemmiparous state of this moss in Sussex with the nerve elongated and projecting beyond the apex of the leaf. On the continent this species is considered to be rare.

5. *Didymodon? recurvifolius* Tayl. (*drooping-leaved Didymodon*); stem elongated, loosely cæspitose; leaves squarrose, crisped and undulated when dry, elliptic-oblong or ligulate, pale-margined, serrulate; nerve subexcurrent. (TAB. XLI.)

Bryum recurvifolium *Tayl. MS.*

Hab. On Knockavohila, a mountain between Kenmare and Killarney, Ireland, May, 1842, *Dr. Taylor*; barren.

Very different in aspect from the preceding species, with squarrose distant leaves, the stems loosely cæspitose, fragile, especially when dry, flexuose, seldom branched, 1—2 inches long. Leaves widely spreading, and recurved from an erect semiamplexicaul base, wavy but not twisted, distant, incurved and flexuose when dry, yellowish-green, somewhat crowded and enlarged at the summit of the stem, firm and slightly coriaceous, obtuse, with a slight apiculus or mucro formed by the strong subexcurrent nerve; the margin plane, serrulate in the upper half, pale-bordered, of closer texture than the preceding species; areolæ very small, dense, opaque, roundish or dot-like, those at the base of the leaf larger, elongated, pellucid. Fructification unknown, except abortive terminal archegonia with filiform paraphyses. It has some resemblance to *Syrrhopodon fasciculatus* Schwaegr., and also to *Tortula squarrosa*, but differs from *Bryum* and from *Mnium* in the texture of the foliage and in general habit.

26. TRICHOSTOMUM *Br. and Sch.*

DIDYMODON *Hook. and Tayl.* &c. (partly).

TRICHOSTOMUM and DIDYMODON *Hedw.* (partly).

In habit, foliage, ramification, &c., this genus is closely allied to *Tortula*, from which it chiefly differs in the straight, not contorted peristome.

Leaves usually in 5 or in 8 ranks, lanceolate, linear-lanceolate, lanceolato-subulate, or subulato-setaceous, densely cellular above, loosely areolated below, entire, rarely serrulate at the apex ; *nerve* roundish, reaching to or beyond the apex of the leaf.

Inflorescence monoicous, dioicous, rarely synoicous. *Barren flower* (except in one species which has a 1-leaved flower) gemmiform, terminal in the dioicous species ; the structure and fertile flowers as in *Tortula*. *Fruit* mostly solitary, rarely two together. *Capsule* on a long straight subflexuose pedicel, erect, regular, or sometimes curved, oblong, subcylindrical, ovate-oblong, or oval, smooth but seldom glossy, more or less coriaceous. *Calyptra* cucullate, smooth. *Lid* more or less elongated, obliquely rostrate. *Annulus*, when present, simple or compound, fragmentary or regularly dehiscent. *Peristome* single ; *teeth* 32, more or less perfect, disposed in pairs, four-sided, granulose, with many articulations, inflexed, composed of a single series of elongated cellules ; the pairs of teeth unequal, and often so united together that the peristome appears to have only 16 simple or perforated teeth, all of them connected at the base by a narrow and often inconspicuous basilar membrane. *Sporangium* contiguous to the walls of the capsule. *Spores* small, almost smooth.

Bruch and Schimper justly remark that the two genera *Trichostomum* and *Tortula* are very closely connected, and that it would be impossible to separate them if we do not attend to the configuration of the peristome. It remains to be seen whether that will always furnish a satisfactory character ; for the difference is proved to be not so great as was once supposed, and in some species of *Trichostomum*, e. g. *T. rigidulum*, the teeth show a slight torsion from right to left.

The species of *Trichostomum* grow in patches on the ground, and on stones, not upon trees, nor in marshy situations, and are perennial. Sixteen species are described in the *Bryol. Europ.*, of which nine only are found in Britain.

Name from ϑριξ, *a hair*, and στομα, *mouth*, in allusion to the slender teeth.

All the species of our second section, except *T. glaucescens*, are referred by Hampe and C. Müller to another genus, *Leptotrichum*, distinguished from *Trichostomum*, and the group *Pottioideæ*, by the elongated narrow uniform cellules of the leaf.

SECT. I. *Leaves lanceolate or linear-lanceolate.* LANCIFOLIA.

Inflorescence dioicous.

1. *Trichostomum crispulum* Bruch (*curly-leaved Trichostomum*) ; leaves lanceolate or linear-lanceolate, concave and almost cucullate at the apex ; nerve slightly excurrent ; perichætial leaves sheathing below ; capsule erect, regular, oval ; lid

with an oblique beak; annulus none; teeth of the peristome in unequal pairs. (TAB. XLI.)

T. crispulum *Bruch and Müller*, in Regensb. Bot. Zeitung, 1829, p. 395. t. 4. *De Notaris. Bruch and Sch.* Monogr. p. 7. t. 4.

Didymodon crispulus *Wilson* in Suppl. Eng. Bot. t. 2734.

D. Benthami *Arnott.*

Plaubelia tortuosa *Bridel*, Bryol. Univ. i. p. 522.

var. β. brevifolium; densely cæspitose; stems more slender; leaves shorter, lanceolate-acuminate, mucronulate; capsule smaller.

var. γ. angustifolium; densely cæspitose; stems shorter; leaves more crowded, narrowly linear-lanceolate, apiculate; teeth of the peristome more regularly paired.

T. viridulum *Bruch and Müller*, l. c. t. 5. *Mougeot and Nestler*, Stirp. Crypt. No. 915.

Hab. Limestone rocks and banks near the sea. Ormeshead, Caernarvonshire; and near Tros-y-Marian, Anglesey, *W. Wilson.* Near Bristol, *Mr. Thwaites.* Probably not unfrequent in similar situations, but rare in fruit. Fr. June, July.

Stems growing in bright green rather dense patches, from 3 lines to 1 inch long, or more. Lower leaves smaller, more distant, lanceolate; upper leaves longer, and crowded into a terminal tuft, spreading, crisped and intorted when dry, linear-lanceolate, concave, the margin somewhat undulated and incurved, obtuse and somewhat boat-shaped or cucullate at the apex, with a small mucro formed by the projecting nerve. By this character, and by the more evident peristome, this species is distinguished from the next species, which it much resembles.

108. 2. *Trichostomum mutabile* Bruch (*variable Trichostomum*); leaves broader, lanceolate or ligulate, spreading, crisped when dry, margin plane and slightly undulated, the nerve projecting into the straight mucro; capsule ovate; lid rostrate; annulus none; teeth of the peristome very short and irregular. (TAB. XLI.)

T. mutabile *Bruch MS. De Not. Br. and Sch.* Monogr. p. 8. t. 5.

T. brachydontium *Bruch*, l. c. t. 3.

Didymodon brachydontius *Wilson*, Suppl. Eng. Bot. t. 2735.

Gymnostomum tortile *Taylor*, in Fl. Hib. ed. 2.

Tortula humilis *Miss Hutchins*, in Herb. Turner.

Trichostomum flexifolium *in Herb. Turn.*

var. β. densum; densely cæspitose; leaves shorter, lanceolate.

Hab. On moist or shady banks in calcareous soil, and in the crevices of calcareous rocks, generally near the sea. Caernarvonshire, and Anglesey, with the preceding species; also on moist rocks in the Gap of Dunloe, and in other situations near Killarney, Ireland, *W. Wilson.* Near Kenmare, &c., *Dr. Taylor.* Sussex, *Mr. Borrer;* rarely in fruit.

Fr. June, July.

Much resembling the last species in size and general appearance. Foliage of a brighter green. Leaves broader, flatter, not at all cucullate at the apex, the nerve not being incurved but straight when the leaf is seen in profile; they are more or less spreading, crisped and intorted when dry, the upper ones ligulate, somewhat undulated in the margin, which is plane, the strong nerve forming a prominent mucro at the apex. Capsule erect, regular, ovate-oblong or oval, reddish-brown. Fruitstalk yellowish, ½ inch long. Lid rather shorter than the capsule, obliquely rostrate. Peristome extremely irregular and fugacious, the teeth unequal, connected by a narrow basilar membrane, sometimes paired, often very short and inconspicuous, erect, pale or reddish, smooth or granulated. It is distinguished from *Gymnostomum tortile* by its more robust habit, and by the plane-margined leaves. It is closely allied to *Trichostomum flavo-virens* Bruch, which chiefly differs in the longer, pale, thin capsule, and the elongated regularly formed peristome.

3. *Trichostomum tophaceum* Bridel (*bluntish-leaved Trichostomum*); stems densely cæspitose, branched, and fasciculate; leaves spreading from an erect base, lanceolate, rather obtuse, the nerve ceasing below the apex, carinato-concave, margin recurved; capsule erect, regular, oblong, subcylindrical; annulus none; lid obliquely rostrate; teeth of the peristome irregular, cohering in pairs. (Tab. XX.)

T. tophaceum *Bridel,* Mant. Musc. and Bryol. Univer. *De Notaris. Br. and Sch.* Monogr. p. 9. t. 6.

T. linoides *Smith,* Eng. Bot. t. 2295. (not Bryum linoides of *Dickson*).

T. lineare *Smith,* Eng. Bot. t. 1598. (not B. lineare *Dickson*). *De Notaris. Davies,* Wel. Bot. p. 108.

T. trifarium *Smith,* Eng. Bot. t. 1707.

Anacalypta tophacea *Nees and Hornsch.* Bryol. Germ. t. 37. f. 5.

Didymodon trifarius *Hook. and Tayl. Dill.* Musc. t. 47. f. 30. fide Hooker and Arnott.

var. β. brevifolium ; leaves rather acute, broader.

Bryum brevifolium *Dickson,* Crypt. ii. 4.

Hab. On moist rocks, and in wet sandy or clayey places. Very common near Warrington, *W. Wilson.* Near Glasgow. Yorkshire, *Mr. Spruce.* Sussex, *Mr. Mitten.* Fr. Nov.

Stems ½—1 inch high, of a dull deep green colour. Leaves spreading when wet, somewhat twisted when dry, the upper ones (especially those of the perichætium) obtuse, by which character, and by the abbreviated nerve, this species is readily distinguished from *T. rigidulum.* It differs also from that species in the absence of an annulus. The peristome is quite variable. In small dwarfish forms of the species, the teeth seem to be reduced to 16, while in other states there are 32 paired teeth: they are always connected by a basilar membrane which rises somewhat above the orifice of the capsule; and though the teeth are often rather fugacious, the species may by this character be always distinguished from *Didymodon luridus*, a moss which was entirely unknown in Britain when the 2nd edition of *Muscol. Brit.* was published, and is therefore incorrectly cited by Bruch and Schimper.

There is great confusion between *Bryum lineare* and *linoides* of Dickson, in consequence of his having reversed the names of the specimens sent to Smith and Turner. *B. lineare* of Dickson is a tall variety of *Dicranum pellucidum*, and his *B. linoides* a variety of *Tortula unguiculata;* but *Trichost. linoides* of *Eng. Bot.*, sent from Teesdale by Mr. Backhouse, is an unusually tall state of *T. tophaceum; T. lineare* of *Eng. Bot.* is the ordinary state, from Mr. Winch; and *T. trifarium* of *Eng. Bot.* is the smallest state of the species with simple teeth (*Grimmia obtusifolia* Turner, MSS. in *Herb. Turn.*), sent from Clapham Springs by Dr. Abbot.

Swartzia trifaria of Hedwig (*St. Crypt.* ii. t. 28.) is not cited as a synonym, because, in the absence of authentic specimens, it is impossible to identify it with our moss; and Hedwig describes the barren and fertile flowers as being upon the same receptacle, giving reason to suspect that he had *Didymodon rubellus* in view at the time. The remarks of Smith in *Eng. Bot.* on this point are quite inconclusive, he having mistaken the paraphyses of *T. trifarium* for "stamens."

110. 4. *Trichostomum rigidulum* Smith (*rigid-leaved Trichostomum*); stems loosely cæspitose, or densely tufted; leaves spreading, or recurved, lanceolate, carinate, margin recurved, nerve subexcurrent; capsule cylindrical or oblong-ovate, with an annulus; peristome rather long, variable. (Tab. XX.)

T. rigidulum *Smith*, Fl. Brit. p. 1238. *Eng. Bot.* 2178. *Turner. Br. and Sch.* Monogr. p. 10. t. 7.

Didymodon rigidulum *Hedw.* St. Cr. t. 4. *Web. and Mohr. Bridel.*

Bryum rigidulum *Dickson.*

var. β. densum; stems shorter, tufted; capsule elliptic-oblong; calyptra larger; lid with a longer and more slender beak.

Desmatodon rupestris *Funck*, in *Bridel*, Bryol. Univ. (ex parte).

Didymodon rigidulum *Hook. and Tayl.*

Tortula imberbis *Smith*, Eng. Bot. t. 2392.? (not *Dill.* Musc. t. 48. f. 46.)

Hab. On moist rocks, especially near waterfalls. Var. β. on dry exposed walls, especially in limestone districts; never upon sandstone. Fr. Autumn, Winter.

Stems about an inch high, much shorter in the var. β., of a dull tawny green, simple or branched. Leaves erecto-patent, or spreading and recurved, lax and slightly crisped when dry; upper ones oblong-lanceolate, recurved in the margin, keeled, the nerve not ceasing below the summit; areolation dot-like. Capsule erect, long and cylindrical in the typical form, shorter and oval-oblong in the var. β., reddish-brown, on a fruitstalk $\frac{1}{2}$—1 inch in length. Lid half as long as the capsule, obliquely rostrate. Teeth of the peristome connected by a basilar membrane, mostly united in pairs, pale reddish, granular, erect when dry. Annulus fragmentary.

The tall typical state of this moss might easily be mistaken for *Tortula fallax*. It is the moss mentioned in Hook. *Eng. Fl.* vol. v. p. 29., found near Beaumaris by Mr. Wilson. The var. *β.* is the form regarded as the type of the species in *Musc. Brit.*, and this has sometimes been mistaken for *Tortula gracilis*, and at other times has been confounded with *T. fallax.* Due attention to the peristome will obviate such mistakes.

Tortula imberbis of Smith, figured in *Eng. Bot.*, is doubtful. Specimens from Dickson, and from the Dillenian *Herbarium* (*Musc.* t. 48. f. 46.), named as such by Smith, in *Herb. Turner*, appear to belong to *Didymodon rubellus;* but Mr. Eagle's specimens, in the same *Herbarium*, belong to *Trichostomum rigidulum* var. *β.*

SECT. II. *Leaves subulate from a lanceolate base.* SUBULIFOLIA. *Leptotrichum* Hampe.

A. Inflorescence dioicous.

5. *Trichostomum tortile* Schrad. (*twisting Trichostomum*); stems short, loosely cæspitose, simple or branched, subflexuose; leaves secund, or spreading every way, lanceolato-subulate, curved, margin reflexed, nerve excurrent; capsule erect, cylindrical, regular or curved; lid with a short beak; annulus simple; peristome variable. (TAB. XLI.)

T. tortile *Schrad.* *Schwaegr.* Suppl. t. 35. *Bridel.* *Br. and Sch.* Monogr. p. 14. p. 10.
Didymodon tortilis *W. Arnott.* *De Notaris.*
Dicranum tortile *Web. and Mohr.* Bot. Tasch. t. 7. f. 12, 13.
Leptotrichum tortile *C. Müller,* Syn. Musc. i. 454.

var. β. pusillum ; leaves shorter; capsule oval-oblong; peristome shorter.

Trichostomum pusillum *Hedw.* St. Cr. t. 28. f. 2, 4, 9, 10. *Smith,* Fl. Brit., Eng. Bot. t. 2380.
Didymodon pusillus *Hedw.* Sp. Musc. *Web. and Mohr.* *Bridel.*
Barbula curta *Hedw.* St. Cr. t. 31. *Schultz.*
Desmatodon curtus *Bridel.*

Hab. Sandy banks, quarries, &c.; rare. Near Belfast, Ireland, *T. Drummond.* Near Castle Howard, Yorkshire, *Mr. Spruce.* Near Hurst Pierpoint, Sussex, *Mr. Mitten.*
Fr. Oct. Nov.

Stems short, gregarious. Leaves mostly secund, somewhat falcate, straight or very slightly twisted when dry, narrow, lanceolato-subulate, carinate, margin for the most part reflexed, slightly toothed at the apex. Perichætial leaves larger, and sheathing below. Capsule on a straight reddish pedicel, small, subcylindrical, pale reddish-brown, with a red orifice, the walls rather thin. Lid about ¼ of the length of the capsule, conical-acute or rostellate. Teeth of the peristome purplish red, erect or inclined to one side, more or less incurved when dry, varying in length and in the degree of union of each pair, shorter and more imperfect in the var. β.

A smaller and much rarer species than *T. homomallum*, with shorter and broader leaves, much resembling those of *Dicranum varium*, to which species Mr. Mackay's specimens in *Herb. Turn.* belong.

Bryum pusillum of Dickson, in *Herb. Turner*, appears to be a variety of *Weissia controversa* with long and very narrow leaves (not *Tortula linearis*), and is very different from *Trichostomum pusillum* of Hedwig.

112. 6. *Trichostomum flexicaule* Br. and Sch. (*wavy-stemmed Trichostomum*); stems elongated, densely cæspitose, dichotomously-branched and fastigiate, flexuose; leaves spreading or secund, lanceolato-subulate, concave, glossy, denticulate at the apex, nerve broad and predominant; capsule erect, ovate-oblong, small, with an annulus; lid shortly rostellate; teeth of the peristome rather long and unequal. (TAB. XLII.)

Bryol. Europ. Monogr. p. 15. t. 11.
Cynodontium flexicaule *Schwaegr.* Suppl. t. 29.
Didymodon flexicaulis *Bridel. Hartmann.*
D. longirostris? *Hooker* in Eng. Fl. vol. 5.
Leptotrichum flexicaule *C. Müller*, Syn. Musc. i. 449.
var. β. densum; more compactly cæspitose; leaves straighter.

Hab. On calcareous rocks, &c.; not unfrequent on the Scottish mountains, and in Derbyshire, &c., but always barren in Britain. Fr. June.

Growing in glossy yellowish-green tufts, 1—3 inches high or more. Stems slender, fragile, flexuose, beset with radicular fibres. Leaves somewhat crowded, usually secund, flexuose when dry, glossy, yellowish, lower ones brownish, lanceolato-subulate, longer than in the preceding species and more setaceous, with a broader predominant nerve, concave, margin plane, the base narrower than the part above; perichætial leaves larger, sheathing. Capsule small, brownish. Annulus compound. Peristome fugacious, the teeth unequal, granulose, here and there anastomosing at the base.

113. 7. *Trichostomum homomallum* Br. and Sch. (*curve-leaved Didymodon*); stems cæspitose, short, dichotomous; leaves subulato-setaceous, nerve broad, predominant; perichætial leaves sheathing; capsule erect, ovate-oblong, with an annulus; lid short, conical, obtuse; peristome variable, the basilar membrane very short. (TAB. XX.)

Bryol. Europ. Monogr. p. 16. t. 12. (nerve of leaf too narrow, the base too much dilated).
Didymodon homomallum *Hedw.* Sp. Musc. t. 23. *Schwaegr. Bridel. Web and Mohr.*
D. heteromallum *Hook. and Tayl.*
Weissia heteromalla *Hedw.* St. Cr. t. 8. *Bridel.*

Grimmia heteromalla *Smith*, Eng. Bot. t. 1899. *Turner. Web. and Mohr.*
Grimmia homomalla *Smith*, Eng. Bot. t. 1900.
Bryum Weissia *Dickson.*
Leptotrichum homomallum *C. Müller*, Syn. Musc. i. 453.

Hab. On sandy banks, &c. not uncommon, especially in mountainous situations. Fr. Autumn.

Stems from 2 lines to ½ inch high, growing in loosely cohering patches. Leaves mostly secund, especially at the extremity of the branches, in the shorter leaved forms irregularly spreading in all directions, subulato-setaceous from a broad tapering base, shining, nerve rather broad, ill defined, predominant above. Fruitstalk ½—1 inch long, red. Capsule erect, subcylindrical, brown. Peristome reddish-brown, teeth in pairs, often so closely united together as to seem single, erect when dry, the basilar membrane not rising above the orifice of the capsule. When the teeth are thus apparently reduced to 16, the moss becomes *Weissia heteromalla* of Hedwig. Both forms are treated as species of *Grimmia* in *English Botany*, the number of teeth being there considered as only 16, equidistant in the one, and approximated in pairs in the other, an error entirely attributable to Hedwig's inaccurate figure of the peristome of *Didymodon homomallum*, altogether at variance with the definition of the genus in the *Species Muscorum*, which requires "16 pairs of teeth not connected at the base," in contradistinction to *Trichostomum*, which, according to Hedwig, has "16 teeth divided from the narrow base into two filiform segments." The moss now before us strikingly exhibits the futility of such distinctions, viewed as essential characters of genera; for all the gradations from a peristome with 16 simple teeth, to one with 32 teeth in pairs, may be traced even in the same individual; and it is doubtful whether the peristome of this genus should be described, in accordance with the version of Bruch and Schimper, "teeth 32, approximated in pairs," or "teeth 16, divided into two filiform segments, the segments usually connected by means of trabeculæ, so that the 16 teeth seem to be merely perforated." It is very seldom that the crura of a tooth are entirely free, and therefore the latter definition is the most intelligible.

B. Inflorescence monoicous.

8. *Trichostomum subulatum* Bruch (*awl-leaved Trichostomum*); stems short; leaves spreading or slightly secund, subulato-setaceous from an ovate base, nerve predominant; capsule oval; lid conico-rostellate; teeth of the peristome with a very narrow basilar membrane; antheridia naked, axillary. (TAB. XLII.)

T. subulatum *Bruch* in *Salzmann Pl. Tingit. Br. and Sch.* Monogr. p. 17. t. 13.
Didymodon aureus *De Notaris.*
Leptotrichum subulatum *C. Müller*, Syn. Musc. i. 448.

Hab. On banks at Trethowell near Truro, Cornwall, *Rev. Mr. Tozer*; according to a specimen sent to *Professor W. Arnott*, named "Didymodon pusillum operculo rostrato."
Fr. Spring.

Stems 3 or 4 lines in length, cæspitose. Leaves less rigid than in the preceding species, somewhat flexuose when dry. Fruitstalk 3—5 lines long. Capsule roundish or oval. Annulus very obscure (wanting, *B. and S.*). Lid obliquely rostellate, longer than in the preceding.

This very much resembles the smaller forms of *T. homomallum*, but has a shorter capsule and longer lid, and essentially differs in the inflorescence. In the leaves it approaches very nearly to *T. pallidum*, a species which is not found in Britain, and has monoicous inflorescence, gemmiform barren flowers, and very long pale fruitstalks.

115. 9. *Trichostomum glaucescens* Hedw. (*glaucous Trichostomum*); stems branched, fastigiate; leaves linear-lanceolate, erecto-patent, glaucous, denticulate at the apex, margin plane, nerve subexcurrent; capsule erect, oval-oblong; lid conico-rostellate; teeth with a very narrow basilar membrane. (Tab. XXXIII.)

T. glaucescens *Hedw.* St. Cr. t. 37. *Schwaegr. Smith,* Eng. Bot. t. 2381. *Br. and Sch.* Monogr. p. 18. t. 15. *C. Müll.* Syn. Musc. i. 569.

Didymodon glaucescens *Web. and Mohr. Bridel. Hook. and Tayl. Hartmann.*

Hab. Scottish mountains *Mr. Dickson.* Clova mountains. In Glen Phee, on rocks slightly covered with earth, growing amongst *Astragalus campestris, Mr. T. Drummond.*

Fr. Summer.

Stems densely cæspitose, about ½ inch long, remarkable for the glaucous hue of the foliage, which appears to be chiefly owing to the presence of a foreign body. Lower leaves lanceolate, remote; upper leaves linear-lanceolate, crowded into a terminal tuft, spreading, margin plane, nerve reaching to or beyond the denticulated apex. Capsule on a yellowish or reddish pedicel, pale brown, its walls thin. Annulus compound. Lid half as long as the capsule, or shorter. Teeth of the peristome red, variable in size and appearance. Monoicous. Barren flowers gemmiform.

This rare species is not liable to be confounded with any other British moss. It slightly resembles *Weissia verticillata* in general aspect.

27. TORTULA *Schreb. Hook. and Tayl.* Screw-Moss.

BARBULA *Br. and Sch.*

Peristome single; *teeth* 32, very long, filiform, contorted from left to right round the apex of the columella, hygroscopic, distantly articulated, papillose, composed of two series of cellules, each tooth being formed of two roundish filaments in close contact, the inner one somewhat larger than the outer, and usually more deeply coloured (red), the outer one being yellow; all the teeth united by a basilar membrane, which in some species is very narrow and inconspicuous, while in others (especially in the *Syntrichiæ*) the membrane is lengthened out into a tube. *Capsule* erect, on a straight or flexuose pedicel, rarely cernuous, often curved, ovate, ovate-oblong, or cylindrical, smooth, the walls thick or thin. In some species two or more capsules arise from the same receptacle. *Annulus* of one or two series of cellules. *Lid* almost subulate, with a narrow conical base, and usually an oblique beak, the cellules composing it spirally arranged in the same direction as the teeth of the peristome. *Calyptra* cucullate, with a long beak, the lateral fissure taking a spiral direction; it usually falls off with the lid. *Sporangium* contiguous with the walls of the capsule (and probably continuous with the inner series of cellules composing the peristome). *Spores* small, almost smooth.

Stems short or tall, more or less cæspitose, seldom gregarious, usually dichotomous, the innovations being mostly two in number, and arising from below the flower.

Leaves in 5 or 8 rows, more or less crowded, suberect, or spreading, or recurved, variously curved, sometimes crisped or twisted when dry, linear-lanceolate, lanceolate, ovate-lanceolate, or subspathulate, concave or carinate, mostly entire in the margin, which is either reflexed, plane, or inflexed, sometimes thickened; *nerve* either excurrent, forming a mucro or a hair-like termination, or ceasing below the apex, very broad in the *Aloideæ*, and covered on the upper side with articulated filiform gemmæ; *areolæ* in the upper part of the leaf, dense, roundish, small, and rather opaque; larger and diaphanous below.

Inflorescence monoicous, dioicous, rarely synoicous. *Barren flower* gemmiform; *anthers* oblong, shortly pedicellate, with filiform or subclavate paraphyses; *archegonia* with styles of moderate length, not numerous, mostly with paraphyses.

Growing on the ground, on rocks, walls, rarely upon trees, and still more seldom in marshes. Mostly perennial, but some of the species seem to be biennial.

This genus (named from *tortus*, twisted) is closely allied to *Trichostomum* in mode of growth, in form and texture of the leaves, and in general habit, as to the narrow-leaved species; those with large leaves are allied in these respects to *Desmatoton* and to *Encalypta;* but in the form of the peristome all the species are intimately related to *Trichostomum.* The essential difference will be found in the double row of cellules composing each tooth, and in the distinctly contorted peristome.

We retain the name *Tortula* on the authority of Schreber, who employed it in his *Genera Plantarum*, published in 1791. Bruch and Schimper rely chiefly on Bridel's authority, which is of later date, in support of the name *Barbula;* but even Bridel employed *Tortula* in his earliest work, and changed the name under a mistaken impression that it was untenable. Thirty-two species are described in the *Bryologia Europea.*

SECT. I. *Leaves rigid, covered on the upper side with a mass of cellular-jointed filaments arising from the broad nerve.* ALOIDEÆ.

116. 1. *Tortula rigida* Schultz (*rigid Screw-Moss*); dioicous; stems short; leaves oblong, obtuse, margin membranaceous and inflexed; capsule elliptic-oblong, straight and erect; annulus distinct; lid obliquely rostrate, crenulate at the base; calyptra covering half the capsule; peristome rather long, much contorted. (TAB. XXXII.)

Barbula rigida *Schultz*, Recens. Gen. Barbul. et Syntr. t. 32. f. 1. *Web. and Mohr.* (ex parte). *Bruch and Schimp.* Monogr. p. 13. t. 1.

Tortula enervis *Hook. and Tayl. Dill.* Musc. t. 49. f. 55.

Tortula brevirostris *Greville*, Scot. Cr. Fl. t. 331. *Hook. and Tayl.*

var. β. mucronulata, leaves with a very short mucro.

var. γ. pilifera, upper leaves piliferous.

Tortula bifrons *De Notaris.*

Hab. On walls, chiefly of limestone, chalk pits, &c. On an old wall near Edinburgh, *D. Stewart, Esq.* Near York, *Mr. Spruce.* Gloucestershire, *Mr. R. M. Stark* and *Mr. Thwaites.* Sussex, *Mr. Mitten.* Near Dublin, *Mr. D. Moore.* Fr. Nov. Dec.

Stems gregarious or loosely cæspitose, 1 or 2 lines long, scarcely branched, thick and rather succulent, bearing from 6—12 leaves. Leaves widely spreading from an erect somewhat sheathing base, dark green, glossy, the membranous margin strongly inflexed so as almost to conceal the numerous cellular filaments which cover the broad inconspicuous nerve. Capsule erect and symmetrical, always more or less elliptical, never cylindrical. Lid subulate. Annulus very distinct. Teeth of the peristome more contorted than in the allied species, connected by a very narrow basilar membrane. Barren-flowered plants very small, with few leaves.

This may always be known from the two following species by the elliptical form of the capsule, half covered by the calyptra. The leaves also are more obtuse, and commonly shorter. It is also smaller in all its parts. Specimens from Sussex have the capsule shorter and almost oval; those from Gloucestershire and Edinburgh have the lid and peristome unusually short. The true *T. brevirostris* is a distinct species, with synoicous flowers, and has never been found in Britain.

117. 2. *Tortula ambigua* Br. and Sch. (*taller rigid Screw-Moss*); dioicous; stems short; leaves spreading, ligulato-lanceolate, rather obtuse, concave and cucullate at the apex, margin incurved; capsule cylindrical, erect; annulus subpersistent; lid shorter; calyptra reaching very little below the lid; teeth of the peristome filiform, slightly contorted, incurved when dry. (TAB. XLII.)

Barbula ambigua *Br. and Sch.* Broyol. Europ. Monogr. p. 14. t. 2.

Barbula rigida *Hedw.* St. Cr. t. 25. f. 3. 5. *Bridel.*
Tortula rigida *Hook. and Tayl.* (ex parte) (not T. brevirostris *Hook. and Tayl.*)

Hab. On walls and banks, chiefly argillaceous or marly. Near York, *Mr. Spruce.* Near Oxford, near Clitheroc, and near Warrington, Lancashire, growing with T. aloides, *W. Wilson.* Very common on walls near Dublin. Bristol, *Mr. Thwaites.* Sussex, *Mr. Mitten.* Probably as frequent as T. aloides, with which it has been usually confounded.
Fr. Nov. Dec.

In aspect similar to the preceding, but larger. Leaves longer, more incurved when dry, concave and cucullate at the apex. Capsule cylindrical, not at all elliptical, erect. Annulus obscure. Lid more dilated at the base. Peristome only slightly contorted; teeth filiform, narrower at the base than in the next species, of a brighter red, when dry spreading below, and incurved in the upper part. Calyptra covering very little more than the lid, which is shorter than in the normal state of *T. rigida.*

It is easily known from *T. rigida* by the cylindrical capsule; and from *T. aloides* by the erect capsule and filiform teeth, arcuato-incurved when dry.

3. *Tortula aloides* Br. and Sch. (*aloe-leaved Screw-Moss*); dioicous; stems short; leaves spreading, linear-lanceolate, rigid, acute, more strongly nerved; capsule cylindrical, *oblique;* annulus fragmentary; lid rostrate, conical at the base; teeth of the peristome paired, scarcely contorted, divaricate when dry; calyptra covering only the lid. (TAB. XLII.)
Barbula aloides *Br. and Sch.* Monogr. p. 15. t. 2.
Trichostomum aloides *Koch* in *Bridel* Br. Univ.
Tortula rigida *Hook. and Tayl.* *Turner.* *Smith,* Eng. Bot. Suppl. t. 2759.
Bryum rigidum *Eng. Bot.* t. 180. *Hudson.* *Dickson.*

Hab. On clay banks. Fr. Nov. Dec.

Similar to the preceding species. Leaves more rigid and acute, with a stronger, more evident, often reddish, nerve. Fruitstalk usually curved in the upper part, hence the capsule is inclined. The capsule is usually of a paler colour, and yellowish-brown on the lower side. Annulus persistent and rather obscure. Lid dilated and conical at the base, with an obtuse beak. Teeth of the peristome almost straight, scarcely at all contorted, tapering from a broad pale base, evidently paired and divaricate when dry. Spores twice as large as in the two preceding species.

SECT. II. *Leaves naked; nerve narrow.*

a. Leaves narrow, lanceolate.

† Leaves almost straight when dry. *Unguiculatæ.*

4. *Tortula unguiculata* Hedw. (*Bird's-claw Screw-Moss*); dioicous; stems cæspitose, dichotomously branched; leaves

more or less spreading, slightly contorted when dry, oblong-lanceolate, obtuse, apiculate, or mucronate, margin recurved, nerve excurrent; capsule subcylindrical, erect; lid subulate. (TAB. XII.)

Barbula unguiculata *Hedw.* St. Cr. t. 23. *Schwaegr. Web. and Mohr. Schultz,* l. c. t. 32. f. 1, 2. *Bridel. Br. and Sch.* Monogr. p. 19. t. 5, 6.

Tortula unguiculata *Hook. and Tayl. Dill.* Musc. t. 48. f. 47, 48, 49.

Bryum linoides *Dicks.* Crypt. fasc. 3. p. 8. t. 8. f. 3.

Barbula linoides *Bridel.*

T. mucronulata *Turner. Smith,* Eng. Bot. t. 1299.

T. humilis *Turner,* Eng. Bot. 1663. (not Barbula humilis *Hedw. and Schwaegr.*).

var. β. cuspidata ; stems shorter; leaves (especially those of the perichætium) narrower, with a longer mucro.

Barbula cuspidata *Schultz,* l. c. t. 32. f. 14. a.

B. lanceolata *Hedw.* Sp. M. t. 26.

Tortula ericetorum *Smith,* Eng. Bot. t. 2495.?

Bryum ericetorum *Dicks.* ?

var. γ. apiculata ; leaves spreading and recurved, with a long mucro.

Barbula apiculata *Hedw.* Sp. Musc. t. 26. f. 1—4. *Schultz,* l. c. t. 38. f. 17. *Schwaegr.*

B. stricta *Hedw.* Sp. M. t. 26. ?

Tortula apiculata *Turner. Smith,* Eng. Bot. t. 2494.

T. aristata *Smith,* Eng. Bot. t. 2393.

Bryum aristatum *Dickson.*

T. barbarta *Smith,* Eng. Bot. t. 2391.

var. δ. microcarpa ; resembling the last var.; stems more slender; leaves more crowded, shorter, spreading, and recurved; capsule small, oval, or oval-oblong; lid conico-subulate.

Barbula microcarpa *Schultz,* l. c. t. 33. f. 18.

var. ε. obtusifolia ; more robust than the last; leaves crowded, shorter, broader, obtuse, very shortly mucronate, or quite muticous; capsule slender, subcylindrical.

Barbula obtusifolia *Schultz,* l. c. t. 32. f. 13. (not *Schwaegr.* Suppl. t. 31.). *Bridel.*

var. ζ. fastigiata ; with long innovations, fastigiate; leaves larger, slightly undulated.

Barbula fastigiata *Schultz,* t. 33. f. 15.

Hab. Banks and hedges, frequent, especially in a clayey soil. Fr. Dec.

Stems varying in height, sometimes an inch long, usually less. Leaves almost ligulate, obtuse and apiculate, with recurved margins, when dry appressed and somewhat contorted. Fruitstalk reddish, an inch long. Teeth of the peristome with a very narrow basilar membrane. Annulus none.

The obtuse mucronate leaves, oblong capsule without annulus, and of a brilliant reddish-brown colour when empty, showing the columella through its thin transparent substance, distinguish this moss from allied species. Unless due attention be paid to the leaves, it is liable to be confounded with *T. fallax.*

Bryum ericetorum of Dickson is doubtful, and so is the Patagonian moss of Dillenius, *Hist. Musc.* t. 45. f. 13. (barren specimen, especially). The fertile specimen resembles *Trichostomum Barbula* Schwaegr.

Grimmia Starkeana of Turner, *Musc. Hib.*, from Rathmines Bridge near Dublin, according to very imperfect specimens in *Herb. Turn.*, appears to be only a state of *Tortula unguiculata.*

5. *Tortula gracilis* Schwaegr. (*slender Screw-Moss*); dioicous; stems loosely cæspitose, fastigiate; leaves erecto-patent, imbricated when dry, straight, lanceolate, carinato-concave, margin recurved, nerve excurrent; perichætial leaves larger, sheathing, subulate and flexuose at the apex; capsule ovate-oblong, or ovate; peristome scarcely contorted, with a broadish basilar membrane; annulus none. (Tab. XXXII.)

Barbula gracilis *Schwaegr.* Suppl. t. 34. *Schultz,* l. c. t. 32. f. 3. *Br. and Sch.* Monogr. p. 22. t. 8.

var. β. viridis; stem longer; leaves narrower, light green, loosely imbricated and somewhat twisted when dry; capsule oblong.

Tortula fallax stricta *De Notaris.*

Hab. Gravelly and chalky banks, &c. Fr. Spring.

This species is a doubtful native of Britain. The only specimens which we can at all admit as genuine examples of the species were gathered on Durdham Down, near Bristol, by Mr. Thwaites, and they are without fruit. The specimens treated as such in *Musc. Brit.* ed. 2., and in Brewster's *Edinb. Journal of Science*, by Hook. and Tayl., and Hook. and Greville, are by no means to be relied upon, and may be regarded as varieties of *T. fallax,* to which even the above variety *β. viridis* may perhaps also belong.

This moss differs from *T. fallax* in its smaller size, short, straight leaves, imbricated and appressed when dry, those of the perichætium more crowded, erect, much produced and narrowed at the point, which is flexuose and almost cirrhiform. Capsule ovate, on a short thick pedicel.

6. *Tortula fallax* Hedwig (*fallacious Screw-Moss*); dioicous; stems cæspitose; leaves spreading, squarroso-recurved, somewhat twisted when dry, lanceolate, acuminate, carinate, margin recurved, nerve subexcurrent; perichætial leaves sheathing, recurved; capsule subcylindrical; annulus none; lid rostrate. (Tab. XII.)

Barbula fallax *Hedw.* St. Cr. t. 24. *Schultz,* l. c. t. 33. f. 21. a. *Bridel. Br. and Sch.* Monogr. p. 23. t. 9.

Tortula fallax *Swartz. Turner. Smith,* Eng. Bot. t. 2179. *Hook and Tayl. De Notaris.*

var. β. brevicaulis; stems short, scarcely branched; leaves crowded, spreading, somewhat wavy in the margin; lid with a short beak.

Barbula brevicaulis *Schwaegr.* Suppl. t. 32. *Schultz,* l. c. t. 33. f. 20. *Bridel.*

var. γ. *brevifolia;* stems densely cæspitose, slender, fastigiate; leaves ovate-lanceolate, shorter; perichætial leaves shorter.

Barbula brevifolia *Bridel.*

Tortula brevifolia *Smith,* Fl. Brit.? Eng. Bot. t. 2453.?

B. fallax var. β. brevifolia *Schultz,* l. c. t. 33. f. 21. B.

var. δ. *recurvifolia;* stems slender; leaves very much recurved, subtrifarious.

Grimmia recurvifolia *Wils. MSS.*

Hab. Banks, &c., especially in a calcareous or clayey soil. Var. δ. on walls, &c., in limestone districts; usually barren. In fruit, on the sands of Barrie near Dundee, and on moist banks at Ravelrig Toll, near Edinburgh. Distributed by the late T. Drummond under the name of *T. gracilis* (see his *Musci Scotici*). Fr. Nov. Dec.

Growing in patches of a rusty green colour. Stems ½—1 inch long and more. Leaves more or less spreading and recurved, when dry somewhat twisted, lanceolate, at the base rather broad, with two plicæ, according to Bruch and Schimper, acuminate or tapering, nerved to or beyond the acute apex, reddish or lurid green. Perichætial leaves lax, somewhat recurved. Capsule variable in shape, usually oblong or subcylindrical, on a reddish pedicel. Annulus none. Lid often nearly as long as the capsule. Peristome long, twisted, red, fugacious, the basilar membrane very narrow.

The var. δ. is remarkable in a barren state for its trifarious, widely spreading, and very much recurved leaves. The supposed fertile specimens have trifarious leaves only on the innovations. They differ from *T. gracilis,* to which they have been referred by Hooker and Greville, in the recurved not straight leaves, and in the structure of the perichætium.

Dickson's *Bryum brevifolium* is *Trichostomum tophaceum,* in *Herb. Turner;* and *T. Stokesii* and *T. elongata* Turn. MSS. of the same *Herbarium* are varieties of *T. fallax.*

122. 7. *Tortula vinealis* Bridel (*soft-tufted Screw-Moss*); dioicous; stems cæspitose; leaves spreading, recurved, ovate-lanceolate, and linear-lanceolate, margin less recurved and nearly plane in the upper half; capsule ovate-oblong, erect, with an annulus; lid with a shorter beak; peristome with a more evident basilar membrane, once contorted. (TAB. XLII.)

Barbula vinealis *Brid.* Br. Univ. i. 830. *Br. and Sch.* Monogr. p. 24. t. 10.

Tortula fallax vinealis *De Notaris.*

T. unguiculata *Turner?* *Smith,* Eng. Bot. t. 2316.

var. β. *flaccida;* stem longer, flexuose; leaves less crowded, narrower, much crisped or curved when dry.

Tortula insulana *De Notaris.*
Zygotrichia cylindrica *Taylor* in Fl. Hib.

Hab. On walls, &c. Common in Sussex, *Mr. Borrer* and *Mr. Mitten.* Yorkshire, *Mr. Spruce.* Frequent in Lancashire and Cheshire; barren. Var. β. on banks, stones, and walls near rivulets. Ireland, *Dr. Taylor.* Near Wrexham, near Congleton, Cheshire, and in fine fruit on a bridge at Capesthorn, Cheshire, *W. Wilson.* Very rarely found in fruit.
Fr. April, May.

This differs from the preceding species in the thicker more elliptical capsule, in the distinct annulus, shorter lid, shorter, pale, almost white peristome, which is less twisted, and has a broader basilar membrane. Leaves with plane margins in the upper half, narrower, more crisped when dry, areolation smaller, colour often yellowish. The season of maturity is also totally different. The form considered as the var. β. by Bruch and Schimper is by far the most common in Britain, and is more probably the typical form of the species. It appears to have been very commonly confounded with *T. fallax*, but may easily be recognised, even in a barren state, by its yellowish, subflaccid, crisped foliage.

†† Leaves twisted and cirrhate when dry. *Tortuosæ.*

8. *Tortula tortuosa* Web. and Mohr. (*curly-leaved Screw-Moss*); dioicous; stems tufted, elongated, dichotomously branched; leaves crowded, spreading, flexuose, linear-lanceolate, or linear-subulate, margin plane and somewhat undulated, nerve excurrent; perichætial leaves sheathing, all of them cirrhate and crisped when dry; capsule suberect, ovate-oblong, regular or incurved. (TAB. XII.)

Barbula tortuosa *Web. and Mohr.* Bot. Tasch. p. 205. *Schwaegr.* Suppl. t. 33. *Schultz*, l. c. t. 34. f. 28. *Bridel. Br. and Sch.* Monogr. p. 26. t. 13.
Tortula tortuosa *Hedw.* Sp. M. *Turner. Smith*, Eng. Bot. t. 1708. *Hook. and Tayl.*
Bryum tortuosum *Linn. Dill.* Musc. t. 48. f. 40.

Hab. On rocks, chiefly of limestone, not common in fruit. Frequent about Matlock. Fr. July.

Stems ½ inch to 3 inches long, growing in yellowish-green tufts, often of considerable breadth. Leaves very long, almost linear, tapering to an acute point, margin plane and undulated, nerve pale and excurrent, areolæ small and dense above, suddenly enlarged and diaphanous towards the base, by which character it may always be distinguished in a barren state from *Didymodon cylindricus*, which it otherwise very closely resembles in the foliage. Perichætial leaves longer, very narrow and tapering above. Capsule on a long yellowish pedicel, erect or inclined, straight or incurved, yellowish-brown, its walls thin. reddish at the mouth. Peristome red, much contorted, the basilar membrane very narrow. It varies with shorter, less crisped leaves, and the stems more densely tufted. It is one of the largest species of the genus. *Tortula inclinata*, a nearly allied species, is smaller, with shorter, inclined, and usually arcuate capsules; the stems more loosely cæspitose; leaves shorter, somewhat obtuse and mucronulate, not tapering at the point.

124. 9. *Tortula squarrosa* De Notaris (*spreading-leaved Screw-Moss*); dioicous; stems cæspitose; leaves squarrose from a broad sheathing base, recurved, lanceolate, slightly undulated, margin plane, serrulate at the apex, nerve subexcurrent; capsule erect, oblong, slightly curved; lid conico-subulate; annulus simple. (TAB. XLIII.)

Tortula? squarrosa *De Notaris*, Syll. Muscorum, p. 180. Ejusdem Barbul. Specimen, No. 29.
Barbula squarrosa *Bryol. Eur.* fasc. 31. Monogr. Suppl. t. Suppl. i.
Didymodon recurvifolius *Taylor MSS.*

Hab. On chalk hills, &c. Portmarnock, near Dublin, *Dr. Taylor*. Beach at Shoreham, Sussex, *W. Wilson*, 1837. Woolsonbury Hill, near Hurst Pierpoint, *Mr. Mitten*. The fruit very rare, not observed in Britain. Fr. Spring?

Stems an inch long and more. Leaves squarrose and recurved, crisped and twisted when dry, the sheathing base broader, and composed in the margin of large diaphanous cellules, by which mark the species is easily recognised, lanceolate or oblong, denticulate towards the acute apex. Perichætia in fertile specimens often two or three together, some of them lateral by the quick and continued growth of innovations; hence there are several fruitstalks in close proximity at the top of a fertile stem. Fruitstalks an inch long. Capsule subcylindrical, tapering below, narrow, more or less curved, pale, its walls thin. Lid conico-subulate, half as long as the capsule. Annulus of a single row of cellules. Peristome distinctly contorted, the teeth long, filiform, distinctly papillose, basilar membrane very narrow.

The habit of this moss is very similar to that of *Didymodon squarrosum*, Hook. Musc. Exot. t. 150., and we rely entirely on the figure and description given by Bruch and Schimper as to the peristome; for we have never seen it in a perfect state. The barren-flowered plants have not yet been found.

††† Leaves very much revolute in the margin; perichætial leaves sheathing.
Revolutæ.

125. 10. *Tortula revoluta* Schwaegr. (*revolute Screw-Moss*); dioicous; stems compactly cæspitose; leaves erecto-pent, imbricated and slightly contorted when dry, oblong-lanceolate, rather obtuse, nerve incrassated above and slightly excurrent, margin strongly revolute; perichætial leaves elongate loosely sheathing; capsule oval-oblong; lid somewhat oblique; annulus simple; peristome with an evident basilar membrane. (TAB. XII.)

Barbula revoluta *Schwaegr.* Suppl. t. 32. *Schultz*, l. c. t. 33. f. 23. *Bryol. Br. and Sch.* Monogr. p. 2. t. 14.

Tortula nervosa *Smith* in Eng. Bot. t. 2383. (fig. not good; too much like *T. Hornschuchiana.*)
T. revoluta *Hook. and Tayl. De Notaris.*
Bryum convolutum *Dickson,* Crypt. fasc. 2. p. 6. (Herb. Turner).

Hab. On walls, especially of limestone, occasionally upon sandstone. Fr. April.

Stems very short, densely crowded, forming pale yellowish-green patches. Leaves crowded, suberect, slightly recurved, oblong, almost subulate, the margin strongly revolute, nerve thick, especially in the upper part, forming a very slight mucro to the otherwise obtuse apex of the leaf. Capsule on a reddish pedicel, rather small, erect, oblong-oval, reddish-brown.

This species differs from *T. convoluta* in the revolute margins of the leaves, in the shorter and more lax perichætium, erect and shorter capsules, and red fruitstalks. It is more closely allied to *T. Hornschuchiana*, differing in the obtuse leaves and thick nerve. Some of the specimens in *Herb. Turner*, from Mr. Hempsted, belong to the next species, and may have been figured by mistake in *Eng. Bot.*; but all the specimens in *Herb. Smith* belong to *T. revoluta.*

26. 11. *Tortula Hornschuchiana* Schultz (*Hornschuch's Screw-Moss*); dioicous; stems loosely cæspitose; leaves ovato-lanceolate, acuminate, spreading, margin revolute, nerve thinner and more excurrent; perichætial leaves lax; capsule oblong, with a narrow annulus. (TAB. XLIII.)

Barbula Hornschuchiana *Schultz,* l. c. t. 33. f. 25. *Br. and Sch.* Monogr. p. 28. t. 10.
Tortula revoluta β. Hornschuchiana *Bridel. De Notaris.*
Barbula revoluta *Web. and Mohr.*
Tortula revoluta *Hook. and Taylor* (for the most part).

Hab. On walls and rocks, also on banks in marly soil. Near Beaumaris, and other places in Anglesey. Near Newton Viaduct, Lancashire, *W. Wilson.* Yorkshire, *Mr. Spruce.* Probably not uncommon, but usually confounded with the preceding species. Fr. April, May.

Very similar to the preceding species. Stems less densely crowded, forming patches of a duller green colour. Leaves less crowded, more spreading and more evidently recurved, gradually tapering from near the base to an acute point, the margin less strongly revolute, the nerve considerably thinner and more evidently excurrent, areolæ larger; when dry the leaves are loosely imbricated and somewhat incurved, not convolute, less glossy and firm than in *T. revoluta.* Perichætial leaves larger, more lax, and tapering to a point. Capsule somewhat longer, slightly curved; annulus not so broad. It is easily distinguished by the acute leaves from the preceding species.

†††† Leaves with plane margins; perichætial leaves elongated and convolute. *Convolutæ.*

7, 12. *Tortula convoluta* Hedw. (*convolute Screw-Moss*); dioicous; stems densely cæspitose; leaves spreading, oblong-lancethe genus. *Tortula inclinata*, a nearly allied species, is smaller, with shorter, inclined, and usually arcuate capsules; the stems more loosely cæspitose; leaves shorter, somewhat obtuse and mucronulate, not tapering at the point.

124. 9. *Tortula squarrosa* De Notaris (*spreading-leaved Screw-Moss*); dioicous; stems cæspitose; leaves squarrose from a broad sheathing base, recurved, lanceolate, slightly undulated, margin plane, serrulate at the apex, nerve subexcurrent; capsule erect, oblong, slightly curved; lid conico-subulate; annulus simple. (TAB. XLIII.)

Tortula? squarrosa *De Notaris*, Syll. Muscorum, p. 180. Ejusdem Barbul. Specimen, No. 29.
Barbula squarrosa *Bryol. Eur.* fasc. 31. Monogr. Suppl. t. Suppl. i.
Didymodon recurvifolius *Taylor MSS.*

Hab. On chalk hills, &c. Portmarnock, near Dublin, *Dr. Taylor.* Beach at Shoreham, Sussex, *W. Wilson*, 1837. Woolsonbury Hill, near Hurst Pierpoint, *Mr. Mitten.* The fruit very rare, not observed in Britain. Fr. Spring?

Stems an inch long and more. Leaves squarrose and recurved, crisped and twisted when dry, the sheathing base broader, and composed in the margin of large diaphanous cellules, by which mark the species is easily recognised, lanceolate or oblong, denticulate towards the acute apex. Perichætia in fertile specimens often two or three together, some of them lateral by the quick and continued growth of innovations; hence there are several fruitstalks in close proximity at the top of a fertile stem. Fruitstalks an inch long. Capsule subcylindrical, tapering below, narrow, more or less curved, pale, its walls thin. Lid conico-subulate, half as long as the capsule. Annulus of a single row of cellules. Peristome distinctly contorted, the teeth long, filiform, distinctly papillose, basilar membrane very narrow.

The habit of this moss is very similar to that of *Didymodon squarrosum*, Hook. Musc. Exot. t. 150., and we rely entirely on the figure and description given by Bruch and Schimper as to the peristome; for we have never seen it in a perfect state. The barren-flowered plants have not yet been found.

††† Leaves very much revolute in the margin; perichætial leaves sheathing.
Revolutæ.

125. 10. *Tortula revoluta* Schwaegr. (*revolute Screw-Moss*); dioicous; stems compactly cæspitose; leaves erecto-patent, imbricated and slightly contorted when dry, oblong-lanceolate, rather obtuse, nerve incrassated above and slightly excurrent, margin strongly revolute; perichætial leaves elongated, loosely sheathing; capsule oval-oblong; lid somewhat oblique; annulus simple; peristome with an evident basilar membrane. (TAB. XII.)

Barbula revoluta *Schwaegr.* Suppl. t. 32. *Schultz*, l. c. t. 33. f. 23. *Bryol. Br. and Sch.* Monogr. p. 27. t. 14.

Tortula nervosa *Smith* in Eng. Bot. t. 2383. (fig. not good; too much like *T. Hornschuchiana.*)
T. revoluta *Hook. and Tayl. De Notaris.*
Bryum convolutum *Dickson,* Crypt. fasc. 2. p. 6. (Herb. Turner).

Hab. On walls, especially of limestone, occasionally upon sandstone. Fr. April.

Stems very short, densely crowded, forming pale yellowish-green patches. Leaves crowded, suberect, slightly recurved, oblong, almost subulate, the margin strongly revolute, nerve thick, especially in the upper part, forming a very slight mucro to the otherwise obtuse apex of the leaf. Capsule on a reddish pedicel, rather small, erect, oblong-oval, reddish-brown.

This species differs from *T. convoluta* in the revolute margins of the leaves, in the shorter and more lax perichætium, erect and shorter capsules, and red fruitstalks. It is more closely allied to *T. Hornschuchiana*, differing in the obtuse leaves and thick nerve. Some of the specimens in *Herb. Turner*, from Mr. Hempsted, belong to the next species, and may have been figured by mistake in *Eng. Bot.*; but all the specimens in *Herb. Smith* belong to *T. revoluta.*

26. 11. *Tortula Hornschuchiana* Schultz (*Hornschuch's Screw-Moss*); dioicous; stems loosely cæspitose; leaves ovato-lanceolate, acuminate, spreading, margin revolute, nerve thinner and more excurrent; perichætial leaves lax; capsule oblong, with a narrow annulus. (TAB. XLIII.)

Barbula Hornschuchiana *Schultz,* l. c. t. 33. f. 25. *Br. and Sch.* Monogr. p. 28. t. 10.
Tortula revoluta *β.* Hornschuchiana *Bridel. De Notaris.*
Barbula revoluta *Web. and Mohr.*
Tortula revoluta *Hook. and Taylor* (for the most part).

Hab. On walls and rocks, also on banks in marly soil. Near Beaumaris, and other places in Anglesey. Near Newton Viaduct, Lancashire, *W. Wilson.* Yorkshire, *Mr. Spruce.* Probably not uncommon, but usually confounded with the preceding species. Fr. April, May.

Very similar to the preceding species. Stems less densely crowded, forming patches of a duller green colour. Leaves less crowded, more spreading and more evidently recurved, gradually tapering from near the base to an acute point, the margin less strongly revolute, the nerve considerably thinner and more evidently excurrent, areolæ larger; when dry the leaves are loosely imbricated and somewhat incurved, not convolute, less glossy and firm than in *T. revoluta.* Perichætial leaves larger, more lax, and tapering to a point. Capsule somewhat longer, slightly curved; annulus not so broad. It is easily distinguished by the acute leaves from the preceding species.

†††† Leaves with plane margins; perichætial leaves elongated and convolute. *Convolutæ.*

7, 12. *Tortula convoluta* Hedw. (*convolute Screw-Moss*); dioicous; stems densely cæspitose; leaves spreading, oblong-lanceolate, rather obtuse, margin plane or undulated; perichætial leaves elongated, convolute; capsule suberect, ovate-oblong, with a distinct annulus; lid subulate. (TAB. XII.)

Barbula convoluta *Hedw.* St. Cr. t. 32. *Schwaegr. Web. and Mohr. Schultz*, l. c. t. 33. f. 22. *Bridel. Br. and Sch.* Monogr. p. 29. t. 16.

Tortula convoluta *Swartz. Smith*, Eng. Bot. t. 2382. *Hook. and Tayl. De Notaris.*

Bryum convolutum *Dickson?* (partly). *Dill.* Musc. t. 48. f. 44.

B. setaceum *Hudson.*

var. β. Sardoa; inner perichætial leaves acuminated, sometimes with a thin nerve.

Hab. On walls, especially of limestone, and in bare places amongst grass by waysides, &c. Var. β. at Luttrelstown, near Dublin, *Dr. Taylor.* Scotland?, *Mr. Dickson.*

Fr. April, May.

Stems short, forming extensive patches of a pale yellowish-green colour. Leaves widely spreading, crisped when dry, oblong-lanceolate, rather obtuse and apiculate, carinate, margin plane, nerve ceasing at or near the apex. Perichætial leaves remarkably sheathing and convolute, the innermost obtuse and nerveless. Fruitstalk yellowish, pale, and slender, about an inch long. Capsule oblique, rarely quite erect, small, reddish-brown, oblong-ovate. Lid long, obliquely rostrate. Annulus very distinct. Peristome large, much contorted, the basilar membrane evident, as in the preceding species. It is easily known by its plane margined leaves and pale yellow fruitstalks. *T. flavipes*, a nearly allied species not found in Britain, has leaves lanceolato-subulate, more acute, with recurved margins, approaching to *T. vinealis* and *T. fallax.*

b. Leaves widely lanceolate, or spathulato-lanceolate. *Cuneifoliæ.*

† *Tortula stellata;* "stems very short, tufted; leaves oblongo-ovate or ovate, rather concave, subopaque, mucronulate, furnished with a strong brown nerve" (Musc. Brit. ed. 2. TAB. XII.)

Tortula stellata *Smith*, Fl. Brit. Eng. Bot. t. 2384.

Barbula agraria *Hedw.* St. Cr. t. 6. *Schwaegr.*

Bryum stellatum *Dickson*, Crypt. fasc. 2. p. 6. (without the synonyms).

Hab. Scotland, *Mr. Dickson.*

We strongly suspect that Mr. Dickson's specimens were gathered in the West Indies. No other person has found this moss in Europe. It is remarkable for the striated capsule, and is a smaller species than the following. Perhaps some mistake may have arisen; for Swartz (in lit. 1804) thought Dickson's *stellata* different from his own *agraria* in the leaves, capsule, and lid.

128. 13. *Tortula cuneifolia* Dickson (*wedge-leaved Screw-Moss*); monoicous; stems gregarious, short, simple; lower leaves

broadly ovate, acuminate ; upper leaves crowded, oblong-ovate, or spathulate, shortly acuminate, the nerve ceasing below the apex, or prolonged into a hair-like point, all loosely reticulated and soft ; capsule oblong ; lid rather short and obtuse ; annulus narrow ; peristome with a rather broad basilar membrane. (Tab. XII.)

Bryum cuneifolium *Dicks.* Crypt. fasc. 3. p. 7.
Tortula cuneifolia *Smith*, Fl. Brit. Eng. Bot. t. 1510. *Hook. and Tayl.* (not *Turner*, Musc. Hib.) *De Notaris.*
Barbula cuneifolia *Bridel. Web. and Mohr. Schrank. Funk. Br. and Sch.* Monogr. p. 31. t. 17.
B. Dicksoniana *Schultz*, l. c. t. 34. f. 33. *Dill.* Musc. t. 44. f. 15.

Hab. On banks, chiefly near the sea-coast ; rare. In sandy places, Scotland, *Mr. Dickson.* Near Cork, Ireland. Near Garth Ferry, Anglesey, *W. Wilson.* Near Bantry, *Miss Hutchins.* Common in Devonshire, especially near Torquay. Near Yarmouth. Fr. March, April.

Stems very short. Lower leaves distant, roundish, upper ones crowded into a rose-like tuft, widely obovate and concave, all soft and flaccid, crisped when dry, margins plane, nerve thin, variable in length, areolæ larger than usual in the genus, almost pellucid. Fruit-stalk rather long, reddish. Capsule erect, straight, reddish-brown. Lid about one-third the length of the capsule. Annulus subpersistent. Peristome reddish, much contorted. Barren flower 1—3-leaved, lateral on the fertile plant, at first terminal. In our specimens we find the lower leaves most commonly aristate, the nerve being abbreviated in the upper leaves.

It is easily known by its broad flaccid and almost pellucid leaves. *T. cuneifolia* Turn. *Musc. Hib.* belongs to *T. muralis var.* γ, which moss is intermixed with original specimens of *T. cuneifolia* from Dickson ; hence the misconception of the species, by *Web. and Mohr* and others, may be accounted for.

9. 14. *Tortula oblongifolia* Hook. and Wils. (*strap-leaved Screw-Moss*) ; monoicous ; stems short, gregarious ; leaves spreading, sub-flaccid, opaque, erect when dry, elliptic-oblong, rather obtuse, with a very small mucro, nerve slightly excurrent, margin plane ; capsule elongated, narrow, subcylindrical ; lid conico-rostellate ; peristome with a broad basilar membrane. (Tab. XLIII.)

T. muralis β. *Drummond MSS.*

Hab. Moist banks near Dublin, Feb. 1829, *T. Drummond.* Fr. Feb.

This differs from the last species in the opaque oblong leaves, which have the nerve always subexcurrent, but never forming a long mucro ; areolæ small. It approaches so nearly to *Tortula Vahliana* Schultz, that we have at times been inclined to consider it a flaccid variety, and it has in fact been gathered for that species, along with the true *T. Vahliana*, at Cagliari, by Müller. From our moss the true *T.*

Vahliana differs in the spathulate, firmer, not flaccid leaves, with reflexed perfectly entire margin, and very much excurrent nerve; the capsule, also, is more elongated than in our moss, which has the margin of the leaf minutely crenulate. From *Tortula muralis var. æstiva*, our moss may be at once distinguished by its elongated narrow capsules, and by the plane margins of the leaves.

130. 15. *Tortula muralis* Timm. (*wall Screw-Moss*); monoicous; stems cæspitose, short; leaves oblong, obtuse, piliferous, nerve excurrent, margin recurved; capsule erect, oblong; lid conico-rostellate; teeth of the peristome with a narrow basilar membrane, much contorted; annulus narrow, subpersistent. (TAB. XII.)

Barbula muralis *Timm.* Fl. Megap. p. 220. *Web. and Mohr. Bridel. Schultz*, l. c. t. 34. f. 29. *Schwaegr. Br. and Sch.* Monogr. p. 35. t. 20.

Tortula muralis *Hedw. Swartz. Turner. Smith*, Eng. Bot. t. 2033.

Bryum murale *Linn. Dill.* Musc. t. 45. f. 14. A—E.

var. β. incana; stem short, capsule small; leaves shorter, oval-lanceolate, with long hair-points.

var. γ. æstiva; stems more slender; leaves longer, and narrower, linear-lanceolate, shortly mucronate or almost muticous.

Barbula æstiva *Schultz*, l. c. t. 34. f. 32.

B. muralis β. æstiva *Bridel.*

B. cuneifolia *Web. and Mohr. Funk. Turner*, Musc. Hib. p. 51.

var. δ. rupestris; larger and branched; leaves larger, oblong, piliferous; capsule subcylindrical, longer, curved.

Barbula muralis β. rupestris *Schultz*, l. c. t. 24. f. 29. B.

Hab. Walls and stones, abundant. γ. on shady, moist walls. δ. on calcareous rocks and walls. Fr. April, May.

Leaves erecto-patent, erect and scarcely twisted when dry, more or less oblong, or subspathulate, obtuse, the nerve more or less excurrent, margin closely recurved, almost revolute, areolæ small and opaque, colour almost verdigris-green, the hair-like points hoary and smooth. Fruitstalk reddish. Capsule erect and symmetrical, reddish-brown. Lid about half as long as the capsule.

This very common species may always be known by the oblong, obtuse leaves, with strongly recurved margin; to a hasty observer they seem to have a solid thickened border. Var. γ. is dependent on shade and moisture for its character; var. δ. vies in size with *T. subulata*, and it is not easy at first to regard it as a mere variety. All the varieties differ from *T. Vahliana* and its allies in having a very narrow basilar membrane connecting the teeth of the peristome.

131. 16. *Tortula canescens* Bruch (*hoary Screw-Moss*); monoicous; stems gregarious, or cæspitose, short, simple; leaves ovate or obovate, concave, piliferous, margin recurved; cap-

sule erect, oblong; lid conico-rostellate; lower half of the peristome united into a tube. (TAB. XLIII.)

T. canescens *Bruch* in litt. and in Collect. Union. Itin. Esslingens. *Montagne*, Archives de Botanique, vol. i. p. 133. (c. icone). *De Notaris.*

Barbula canescens *Bruch and Sch.* Monogr. p. 34. t. 19.

Hab. Chalk cliffs? Fairlight Glen, near Hastings, Sussex, *Mr. Jenner.* Fr. April.

Stems very short, forming hoary patches, unbranched. Leaves pale green, concave; lower ones almost obovate; upper ones oval-oblong and more crowded, the nerve much excurrent. Fruitstalk 3—6 lines, reddish. Capsule rather small, oblong, reddish-brown, its walls thin. Lid straight, or slightly oblique, rather obtuse. Annulus distinct, of two rows of cellules. Inflorescence as in the preceding.

This resembles small states of *T. muralis*, especially the *var. β. incana;* but is easily distinguished by the evident tubular base of the peristome, which is that of the Bridelian genus *Syntrichia.* The leaves are shorter, of a paler green, more concave, and the margin less strongly recurved.

17. *Tortula marginata* Br. and Sch. (*border-leaved Screw-Moss*); monoicous; stems short, simple, gregarious or cæspitose; leaves oblong-lanceolate, mucronate, with a thickened margin, nerve slightly excurrent; capsule oblong; lid shortly rostrate; teeth of the peristome with a narrow basilar membrane. (TAB. XLIII.)

Barbula marginata *Br. and Sch.* Monogr. p. 33. t. 19.

Tortula cæspitosa *Hook. and Grev.* Brewst. Edin. Journ. Sc. vol. i. p. 296. (not *Schwaegr.* Suppl. t. 21. *Montague. De Notaris.*

Hab. On walls (sandstone), and on stones slightly covered with earth, at Castle Howard, *Mr. Spruce*, 1843; rare. Frequent about Hurst Pierpoint, Sussex, *Mr. Mitten.* Norfolk (*Herb. Turner*, named *T. æstiva*), *F. K. Eagle, Esq.* Fr. May, June.

Resembling *Tortula muralis* in size and general aspect, but a more slender and delicate species. Leaves narrower, often linear, less obtuse, erect and slightly crisped when dry, the margin distinctly thickened and composed of a double row of cellules, nerve excurrent, but not often forming a hair-like point. Fruitstalk paler, and scarcely red, deep yellow in most of the specimens. Capsule reddish-brown, glossy. Lid one-third as long as the capsule, sometimes half as long. Annulus of a double row of cellules. Peristome paler than that of *T. muralis.* Our specimens have narrower leaves than those represented in the *Bryologia Europæa*, but are sufficiently like the specimens of *T. cæspitosa* Hook and Greville, in the *Hookerian Herbarium.* Mr. Mitten finds a variety at Hurst Pierpoint with piliferous leaves which are broader and concave. Infl. certainly monoicous (vid. *Bryol. Eur.* contra).

c. Plants resembling the *Cuneifoliæ*, but larger, and the lower portion of the peristome always united into a tube. *Subulatæ.* (*Syntrichia* of authors.)

133. 18. *Tortula subulata* Bridel (*awl-leaved Screw-Moss*); monoicous; stems cæspitose, simple or branched; leaves oblong-obovate, or subspathulate, acuminate, mucronate, somewhat pale-bordered, margin plane, nerve excurrent; capsule very long, subcylindrical, slightly curved; tubulur base of the peristome very long; annulus subpersistent. (TAB. XII.)

Barbula subulata *Bridel*, Sp. Musc. *Br. and Sch.* Monogr. p. 36. t. 21, 22.

Tortula subulata *Hedw.* Sp. M. t. 37. *Schwaegr.* Suppl. t. 34. *Röhling. Turner. Smith*, Eng. Bot. t. 1101. *Hook. and Tayl. De Notaris.*

T. hercynica *Schrader. Brid.* Musc. Recent.

Syntrichia subulata *Web. and Mohr. Schultz*, l. c. t. 34. f. 1. a. *Bridel*, Bryol. Univ.

Bryum subulatum *Linn. Dill.* Musc. t. 45. f. 10.

var β. subinermis; leaves crowded, oblong, and ovate-lanceolate, with a very indistinct mucro, or muticous, margin plane; capsule and fruitstalk shorter.

Hab. Hedge banks, especially in sandy soil, and about the roots of trees. Var. β. New Forest Hampshire, *C. Lyell, Esq.* River-side above Warrington, with *T. latifolia.*

Fr. May, June.

Stems growing in bright green patches, from 3 lines to an inch long, usually short, yellowish below. Leaves more or less crowded, oblong, sometimes narrowed below, crisped when dry, yellowish or bright green, pellucid in the lower part, somewhat concave, the nerve more or less excurrent, sometimes serrulate at the apex, margin plane or reflexed; sometimes distinctly bordered, the marginal cellules being larger and less opaque than the rest. Fruitstalk about an inch long. Lid rather short.

This species is remarkable for the long capsule, and is not liable to be confounded with any other except *T. mucronifolia*, a species not found in Britain, which has broader, shorter, and more crisped leaves, of more lax texture, not pale-bordered, shorter capsule, and the tube of the peristome shorter. In *T. subulata* the peristome is tubular for half its length, or more, the tubular portion pale, the free part bright red. Annulus narrow. The varieties seem to depend on local causes, and can scarcely be considered permanent: *var. β.* grows on stumps in moist shady situations; *var. γ. inermis*, not known to grow in Great Britain, is now established as a species in *Bryol. Eur.*, having smaller leaves evidently reflexed in the margin, much twisted when dry, and the capsule more slender. A variety found at Clifton Scope, near York, by Mr. Spruce, has the leaves serrulate at the apex, with a distinct thickened border, but we seek in vain for other characters by which it can be distinguished from the ordinary form of the species.

d. Plants taller; stems dichotomously branched with innovations, as in the *Unguiculatæ*, but all the parts larger; peristome as in the *Subulatæ*, tubular at the base. *Rurales.* (*Syntrichia* of authors.)

* Inflorescence dioicous or monoicous.

4- 19. *Tortula latifolia* Br. and Sch. (*wide-leaved Screw-Moss*); dioicous; leaves obovate-spathulate, obtuse, emarginate, lax and spreading, nerve scarcely excurrent; capsule long, subcylindrical; lid shortly rostrate; annulus simple. (Tab. XLIII.)

T. latifolia *Bruch. Hartman.*
Barbula latifolia *Bruch and Sch.* Monogr. p. 41. t. 24.
Syntrichia latifolia *Bruch and Bridel MS.*
S. lævipila β. mutica *Schultz,* l. c. t. 34. f. 4. B. *Bridel,* Bryol. Univ.

Hab. About the roots of trees, and on rotten wood, stones, &c., near rivulets; very seldom in fruit. Near Henfield, Sussex, *Mr. Borrer.* Hurst Pierpoint, Sussex, *Mr. Mitten,* with capsules. Near Glasgow, *Drummond.* Near Warrington, *W. Wilson.* Near York, *Mr. Spruce.* Near Bristol, *Mr. Thwaites.* Fr. Spring.

Stems ½—1 inch high, growing in loose soft lurid green patches. Leaves spreading, somewhat recurved, inflexed and crisped when dry, upper ones crowded, all more or less obovate or spathulate, obtuse and emarginate, with a minute obscure point formed by the scarcely excurrent nerve, margin nearly or quite plane and entire, texture similar to that of the preceding species, and like that of *Encalypta*, to which genus it was supposed by some to belong until the fruit was discovered. Fruitstalk short, rather thick, reddish. Capsule somewhat oblique and curved, rather small for the size of the plant, chestnut-coloured. Lid half as long as the capsule. Annulus small. Peristome tubular below, shorter than in the preceding species. The barren-flowered plants have not been observed.

Distinguished from the preceding by the obovate emarginate leaves, and from *T. lævipila* by the softer, almost flaccid, muticous leaves and dioicous inflorescence.

20. *Tortula lævipila* Brid. (*smaller hairy Screw-Moss*); monoicous; stems tufted; leaves spreading, loosely imbricated when dry, obovate-oblong, or subspathulate, obtuse, the reddish nerve excurrent into a white smoothish hair-point; capsule subcylindrical, curved; peristome much twisted, tubular one-third of its length. (Tab. XLIII.)

Syntrichia lævipila *Bridel. Schultz,* l. c. t. 34. f. 4.
Tortula lævipila *Schwaegr.* Suppl. t. 120. *De Notaris.*
T. ruralis β. lævipila *Hook. and Grev.*
Barbula lævipila *Br. and Sch.* Monogr. p. 40. t. 25.

Hab. Trunks of trees, sometimes also upon detached rocks. Fr. May, June.

Stems about an inch high, seldom more, growing in more compact tufts than *T. ruralis.* The leaves of a greener hue, more erect, less crisped when dry, somewhat panduriform; margin plane in the upper part, slightly recurved below, the piliform extremity nearly or quite smooth; areolæ larger. Peristome shorter, with a shorter tube. Fruitstalk shorter and thicker. Barren flowers gemmiform in the axillæ of the leaves of the fertile stem.

T. alpina Br. and Sch., a species not found in Britain, differs from *T. lævipila,* in having more diaphanous leaves with short purplish hair-points, or often muticous; capsule more slender, on a long slender fruitstalk; tube of the peristome shorter.

136. 21. *Tortula ruralis* Hedw. (*great hairy Screw-Moss*); dioicous; stems tall, dichotomously branched, cæspitose; leaves squarroso-recurved, ovate-oblong or obovate, very obtuse, with rough hair-points, carinate, margin recurved; capsule oblong, subcylindrical, curved; peristome long, with a long tubular base. (TAB. XII.)

Barbula ruralis *Hedw.* Sp. M. p. 121. *Br. and Sch.* Monogr. p. 42. t. 27.
Tortula ruralis *Schwaegr.* Suppl. t. 34. *Swartz. Turner. Smith,* Eng. Bot. t. 2070. *Hook. and Tayl.*
Syntrichia ruralis *Web. and Mohr. Schultz,* l. c. t. 34. f. 3. *Bridel.*

var. β. minor; more compactly cæspitose; leaves erecto-patent, uppermost subrecurved, oval, very obtuse; hair-points very long and rough; capsule shorter.
Syntrichia intermedia *Bridel,* Bryol. Univ.
Tortula ruralis crinita *De Notaris.*

Hab. Walls, and roofs of buildings, especially on thatch, also on sandy banks, seldom on trees. Var. β. on dry calcareous walls; not observed in Britain. Fr. March, April.

Stems growing in large lax yellowish patches, 1—3 inches high. Leaves widely spreading and recurved, crisped or contorted when dry, very obtuse, their white hair-points rough and spinulose, plicato-carinate, margin recurved, areolation smaller than in *T. lævipila,* dense and granular above, lax and diaphanous below. Capsule subcylindrical, its walls thick, reddish-brown. Fruitstalk an inch long. Lid half as long as the capsule. Annulus of a double row of cellules, persistent. Peristome tubular from one-third to one-half its entire length.

Tortula ericetorum of Smith (*Eng. Bot.* t. 2495.) must be different from this. We have referred it to *T. unguiculata.*

In the recurved leaves, *T. ruralis* is more nearly allied to *T. aciphylla* Bryol. Eur., than to *T. lævipila. T. aciphylla* has the leaves acuminated, with red hair-points, ovate-lanceolate; capsule shorter and thicker.

** Inflorescence synoicous.

137. 22. *Tortula Mülleri* Bryol. Eur. (*Müller's Screw-Moss*); synoicous; stems elongated, radiculose; leaves crowded, erecto-patent, straight, imbricated when dry, oblong-oval, broad, obtuse, concave, margin reflexed; the purplish nerve excurrent

into a rather short roughish hair-point; capsule cylindrical, curved, on a long purplish pedicel. (TAB. XLIV.)

Syntrichia Mülleri *Bruch MS.*
Barbula Mülleri *Br. and Sch.* Monogr. p. 44. t. 28.
B. gymnanthos *Bruch MS.*
Tortula princeps *De Notaris.*
T. ruralis Drummond's Musci Scotici (partly).

Hab. On rocks in Scotland, *Mr. T. Drummond.* Fr. Spring.

Stems 1—2 inches long, forming taller and more compact fawn-coloured tufts than the preceding, and beset to the top with radicular fibres of a rusty-brown colour. Leaves crowded, imbricato-patent; when dry, straight, erect, and imbricated; the texture firm, shrinking less than other species by drying; somewhat crowded at intervals, so that the stems appear to be annotinous, having usually but one short solitary innovation from below the fertile flower. Fruitstalk an inch long and more. Capsule with thick walls, straight or curved, chestnut-coloured, with a lid of half its own length. Annulus as in the preceding species. Peristome with a long tubular base.

Distinguished from the allied species by the synoicous flowers, and easily recognised, when once known, by its firm fawn-coloured leaves and peculiar habit. It is the most elegant species of this subdivision of the genus.

*** Inflorescence, &c. unknown.

18. 23. *Tortula papillosa* Wils. (*roughish-leaved Screw-Moss*); stems tufted, rather short, sparingly branched; leaves spreading, erect when dry, obovate, subacute, very concave, shortly hair-pointed, margin plane, strongly involute when dry, papillose at the back, and on the thick spongy gemmiparous nerve; areolæ lax. (TAB. XLIV.)

Hab. On trees, frequently intermixed with *T. lævipila.* Marl, near Conway, N. Wales, July, 1844, *W. Wilson.* Gathered in Rumsey Churchyard, Hants, April, 1818, by Mr. Lyell, as a gemmiferous state of *Tortula ruralis* (see **Hook. and** *Tayl.* Musc. Brit. ed. 2. p. 56.). Near York, ***Mr. Spruce.*** Hurst Pierpoint, Sussex, *Mr. Mitten.*

Growing in olive-green tufts. Stems not above ½ inch long, slightly branched, and fastigiate, the lower leaves brownish and usually decayed, leaving only the nerve. Upper leaves rather crowded, less widely spreading than in *T. lævipila*, more concave, more acute, with shorter and suddenly tapering hair-points, margin not at all reflexed, strongly involute when dry, papillose at the back; nerve considerably thicker and spongy, paler, very rough and papillose; cellular tissue considerably more lax and succulent; the areolæ nearly twice as large, and the diaphanous basilar cellules confined to a much smaller space. The gemmæ, covering the upper part of the nerve, are short and clavate, with 2—4 roundish articulations, soon falling away, and visible only on the younger leaves.

This species is easily recognised when dry by the papillose leaves with strongly involute margins and thick spongy nerve.

crisped when dry, somewhat panduriform; margin plane in the upper part, slightly recurved below, the piliform extremity nearly or quite smooth; areolæ larger. Peristome shorter, with a shorter tube. Fruitstalk shorter and thicker. Barren flowers gemmiform in the axillæ of the leaves of the fertile stem.

T. alpina Br. and Sch., a species not found in Britain, differs from *T. lævipila,* in having more diaphanous leaves with short purplish hair-points, or often muticous; capsule more slender, on a long slender fruitstalk; tube of the peristome shorter.

136. 21. *Tortula ruralis* Hedw. (*great hairy Screw-Moss*); dioicous; stems tall, dichotomously branched, cæspitose; leaves squarroso-recurved, ovate-oblong or obovate, very obtuse, with rough hair-points, carinate, margin recurved; capsule oblong, subcylindrical, curved; peristome long, with a long tubular base. (Tab. XII.)

Barbula ruralis *Hedw.* Sp. M. p. 121. *Br. and Sch.* Monogr. p. 42. t. 27.
Tortula ruralis *Schwaegr.* Suppl. t. 34. *Swartz. Turner. Smith,* Eng. Bot. t. 2070. *Hook. and Tayl.*
Syntrichia ruralis *Web. and Mohr. Schultz,* l. c. t. 34. f. 3. *Bridel.*

var. β. minor; more compactly cæspitose; leaves erectopatent, uppermost subrecurved, oval, very obtuse; hair-points very long and rough; capsule shorter.
Syntrichia intermedia *Bridel,* Bryol. Univ.
Tortula ruralis crinita *De Notaris.*

Hab. Walls, and roofs of buildings, especially on thatch, also on sandy banks, seldom on trees. Var. β. on dry calcareous walls; not observed in Britain. Fr. March, April.

Stems growing in large lax yellowish patches, 1—3 inches high. Leaves widely spreading and recurved, crisped or contorted when dry, very obtuse, their white hair-points rough and spinulose, plicato-carinate, margin recurved, areolation smaller than in *T. lævipila,* dense and granular above, lax and diaphanous below. Capsule subcylindrical, its walls thick, reddish-brown. Fruitstalk an inch long. Lid half as long as the capsule. Annulus of a double row of cellules, persistent. Peristome tubular from one-third to one-half its entire length.

Tortula ericetorum of Smith (*Eng. Bot.* t. 2495.) must be different from this. We have referred it to *T. unguiculata.*

In the recurved leaves, *T. ruralis* is more nearly allied to *T. aciphylla* Bryol. Eur., than to *T. lævipila. T. aciphylla* has the leaves acuminated, with red hair-points, ovate-lanceolate; capsule shorter and thicker.

** Inflorescence synoicous.

137. 22. *Tortula Mülleri* Bryol. Eur. (*Müller's Screw-Moss*); synoicous; stems elongated, radiculose; leaves crowded, erectopatent, straight, imbricated when dry, oblong-oval, broad, obtuse, concave, margin reflexed; the purplish nerve excurrent

into a rather short roughish hair-point; capsule cylindrical, curved, on a long purplish pedicel. (TAB. XLIV.)

Syntrichia Mülleri *Bruch MS.*
Barbula Mülleri *Br. and Sch.* Monogr. p. 44. t. 28.
B. gymnanthos *Bruch MS.*
Tortula princeps *De Notaris.*
T. ruralis Drummond's Musci Scotici (partly).

Hab. On rocks in Scotland, *Mr. T. Drummond.* Fr. Spring.

Stems 1—2 inches long, forming taller and more compact fawn-coloured tufts than the preceding, and beset to the top with radicular fibres of a rusty-brown colour. Leaves crowded, imbricato-patent; when dry, straight, erect, and imbricated; the texture firm, shrinking less than other species by drying; somewhat crowded at intervals, so that the stems appear to be annotinous, having usually but one short solitary innovation from below the fertile flower. Fruitstalk an inch long and more. Capsule with thick walls, straight or curved, chestnut-coloured, with a lid of half its own length. Annulus as in the preceding species. Peristome with a long tubular base.

Distinguished from the allied species by the synoicous flowers, and easily recognised, when once known, by its firm fawn-coloured leaves and peculiar habit. It is the most elegant species of this subdivision of the genus.

*** Inflorescence, &c. unknown.

138. 23. *Tortula papillosa* Wils. (*roughish-leaved Screw-Moss*); stems tufted, rather short, sparingly branched; leaves spreading, erect when dry, obovate, subacute, very concave, shortly hair-pointed, margin plane, strongly involute when dry, papillose at the back, and on the thick spongy gemmiparous nerve; areolæ lax. (TAB. XLIV.)

Hab. On trees, frequently intermixed with *T. lævipila.* Marl, near Conway, N. Wales, July, 1844, *W. Wilson.* Gathered in Rumsey Churchyard, Hants, April, 1818, by Mr. Lyell, as a gemmiferous state of *Tortula ruralis* (see *Hook. and Tayl.* Musc. Brit. ed. 2. p. 56.). Near York, *Mr. Spruce.* Hurst Pierpoint, Sussex, *Mr. Mitten.*

Growing in olive-green tufts. Stems not above ½ inch long, slightly branched, and fastigiate, the lower leaves brownish and usually decayed, leaving only the nerve. Upper leaves rather crowded, less widely spreading than in *T. lævipila*, more concave, more acute, with shorter and suddenly tapering hair-points, margin not at all reflexed, strongly involute when dry, papillose at the back; nerve considerably thicker and spongy, paler, very rough and papillose; cellular tissue considerably more lax and succulent; the areolæ nearly twice as large, and the diaphanous basilar cellules confined to a much smaller space. The gemmæ, covering the upper part of the nerve, are short and clavate, with 2—4 roundish articulations, soon falling away, and visible only on the younger leaves.

This species is easily recognised when dry by the papillose leaves with strongly involute margins and thick spongy nerve.

SUBORDER IX. RIPARIEÆ.

28. CINCLIDOTUS *Br. and Sch.* Water Screw-Moss.

CINCLIDOTUS, RACOMITRIUM, and GYMNOSTOMUM (partly) *Bridel.*

The mosses of this family are large and handsome, growing in water, having the habit of *Fontinalis*, with the peristome of *Tortula;* stems affixed at the base, cæspitose, floating, irregularly branched, acrocarpous and cladocarpous, of the intense or lurid green colour.

Stem flexuose, rooting at the base, and at the insertion of the branches, sometimes with lateral fertile branches, sometimes fertile at the apex, with innovations from below the fertile flower.

Leaves in 5 or 8 rows, lanceolate, of thick and firm texture, composed of small hexagonal cellules, full of chlorophyll, and intensely green, the margin thickened and entire, spreading every way, or falcato-secund; *nerve* strong, excurrent, or ceasing below the apex.

Inflorescence dioicous, lateral or terminal. *Barren flowers* gemmiform, sometimes solitary in the axillæ of the leaves, sometimes clustered on short branches; *antheridia* oblong, shortly pedicellate, with filiform paraphyses. *Fertile flowers* either terminal on the stem and innovations (acranthi), or terminal on the secondary branches (cladanthi), gemmiform; *archegonia* small, with filiform paraphyses.

Capsule immersed in the leaves, or more or less exserted, ovate or oval, the walls thick, smooth, without an annulus. *Lid* conico-rostrate, with a spiral arrangement of the cellular tissue, as in *Tortula. Fruitstalk* rather thick, pale, short, or longer than the leaves, twisting to the right. *Vaginula* more or less perfect. *Calyptra* smooth, conical, erect, split on one side, reaching below the lid. *Peristome* simple; *teeth* 32, perfect, or rudimentary, cohering at the top to the columella, subpapillose, their common membranous base rising above the orifice of the capsule and formed of large rectangular cellules; they are filiform, and composed of two series of cellules, the outer yellow, the inner red, very tender and fugacious, connected together in their lower half by anastomosing processes, so as to appear interlaced, spirally twisted round the columella from right to left, when dry flexuous and incurved. *Columella* sometimes exserted. *Spores* small, smooth, and olive-coloured.

The three species of this genus are usually found growing in water, but two of them are amphibious, and one, *Cinclidotus riparius var. β. terrestris*, is frequently confounded with *Tortula*, with which genus *Cinclidotus* has, indeed, very much affinity in the structure of the peristome; the chief or only difference being, that in *Cinclidotus* the teeth are connected below by anastomosing processes, and not always definite in number. In habit the species of *Cinclidotus* have much mutual resemblance, and in this respect are related to two curious exotic mosses, viz. *Scouleria aquatica*, from North America, and *Wardia hygrometrica*, from the Cape of Good Hope. In the mode of vegetation there is a resemblance to *Fontinalis*, as also to some species of *Racomitrium.*

Although the species of *Cinclidotus* constitute a sufficiently natural group, they differ somewhat in the peristome, which is quite rudimentary in *Cinclidotus aquaticus*, and in the mode of inflorescence. Indeed, this genus, and *Fissidens*, and *Racomitrium* render it doubtful whether the position of the fruit will constitute an absolute basis for the formation of genera; for we find in all these some species that are acrocarpous, and some that are cladocarpous. Bruch and Schimper remark, that on attentive examination we shall find mosses in which there is a transition from *pleurocarpous* fructification (axillary) to *cladocarpous* (terminal on the secondary branches), *e. g.* some species of *Fissidens* and *Cinclidotus fontinaloides*, and some where the *acrocarpous* fructification (terminal on the principal axis) is accompanied by fructification terminal on a secondary axis. When the stem, as in *Cinclidotus fontinaloides*, is irregularly branched, the principal axis is prolonged without interruption, and the lateral branches are fertile at the apex; when the stem, as in *C. riparius*, is annually dichotomous, with innovations, every subdivision bears a terminal flower or fruit. In *C. fontinaloides* the fertile lateral branches present a strong analogy with the perichætial ramuli of pleurocarpous mosses, having the vaginula rudimentary, and formed of the thickened extremity of the branch, but in other respects it strictly agrees with the truly cladocarpous species *C. aquaticus,* which has the vaginula cylindrical and regularly formed, as in the acrocarpous species, *C. riparius.*

The radicles by which the stems are fixed are short, strong, and matted, of a reddish colour, furnished with numerous swollen vesicles, which serve as points of attachment to the place of growth.

The calyptra is strong and coriaceous, and in *C. aquaticus* the base of the calyptra when young is inflexed almost as in *Encalypta.* It often remains till the fruit is ripe, and then falls off with the lid.

The genus is named from κιγκλιδωτος; *latticed,* in allusion to the clathrate, or grated, base of the peristome.

SECT. I. *Acrocarpous.*

139. 1. *Cinclidotus riparius* Walker-Arnott (*larger Water Screw-Moss*); dioicous; stems with fasciculate branches; leaves spread-

ing, oblong-lanceolate, obtuse, with thickened margins, very shortly mucronate, nerve excurrent; capsule exserted on a short thick pedicel, elliptic-oblong; lid obliquely conico-rostrate; peristome with numerous subdivisions. (TAB. XLIV.)

C. riparius *Walker-Arnott*, Disp. Methodique, p. 23. *Br. and Sch.* Monogr. (fasc. 16.) p. 10, 11. t. 2.
Trichostomum riparium *Web. and Mohr. Schwaegr.* Suppl. t. 39. *Hartman.*
Racomitrium riparium *Bridel*, Bryol. Univ.
Gümbelia riparia *C. Müller*, Syn. Musc. ii. 651.

var. β. terrestris; stems shorter, erect, sparingly branched, tufted; leaves less coriaceous, slightly contorted when dry; capsule on a longer pedicel.
Racomitrium flavipes *Bridel*, Bryol. Univ.
Trichostomum flavipes *De Notaris.*
Tortula humilis *Rev. H. Davies,* in Herb. Turn.
Barbula Brebissoni *Bridel*, Bryol. Univ. *Fiör. Mazzanti.*
Tortula cylindrica *Wilson MS.*

Hab. In rivulets, attached to stumps, &c.; the typical form not found in Britain. Var. β. on stones by a rivulet near Llanffinnan, above Pentraeth in Anglesey, April 1828, and Feb. 1830, *W. Wilson.* On the trunks of trees, &c. by rivulets, near Bristol, *Mr. Thwaites.* In similar situations near Hurst Pierpoint, Sussex, *Mr. Mitten.* Burford Bridge, Surrey, *Mr. Borrer.* Fr. April.

This species being known to us, as British, only in the Tortula-like state which constitutes the *var. β. terrestris* of Bruch and Schimper, we shall confine our description to that variety, premising that search has been repeatedly made without success for the aquatic form, and that hence there seems room to doubt whether the two forms may not be specifically distinct; or if not, whether the terrestrial form be not the type of the species, as being of the most frequent occurrence. Bruch and Schimper, however, positively affirm that they have witnessed the existence of every intermediate form between the typical state and the variety, according to the degree of proximity to water, and they point out analogous modifications (of the stem only) in *C. fontinaloides.*

In the *var. β. terrestris,* the stems are about an inch long, loosely tufted, of a brighter, less lurid green than in the aquatic form, sparingly branched and fastigiate. Leaves elliptic-oblong, or lingulate, obtuse, rather crowded, suberect, or spreading, plane, contorted when dry, the margin evidently thickened, nerve slightly excurrent, and forming a minute point. Perichætial leaves longer, erect. Fruit-stalk about $\frac{1}{4}$ inch long, yellowish. Capsule erect, sometimes slightly curved, oblong or subcylindrical, yellowish-brown, its walls rather thick. Lid shorter than the capsule, conico-subulate, oblique, its cellules spirally arranged, as in *Tortula.* Calyptra somewhat cucullate, as in *Tortula*, reaching some distance below the lid, yellowish-brown. Peristome red, very tender and fugacious, its numerous and irregular filiform subdivisions interlaced below, twisted once round the columella, to which it adheres at the summit, as in the next species, with which it closely agrees in structure. Barren-flowered plants not observed in Britain.

This moss bears some resemblance to *Tortula subulata* and its allies; the thick-margined leaves and clathrate peristome furnish the most obvious marks of distinction.

SECT. II. *Cladocarpous.*

140. 2. *Cinclidotus fontinaloides* P. Beauv. (*smaller Water Screw-Moss*); leaves spreading, slightly twisted, lanceolate, acute, keeled, margin thickened, nerve excurrent; perichætial leaves sheathing, ovate-lanceolate, acuminate, submembranous; capsule immersed; vaginula short and imperfect. (TAB. XI.)

C. fontinaloides *Pal. Beauv.* Prodr. p. 52. *Bridel. Hook. and Tayl. De Notaris. Br. and Sch.* Monogr. p. 9, 10. t. 3.
Trichostomum fontinaloides *Hedw.* St. Cr. t. 14. *Turner. Schwaegr. Smith. Weber and Mohr.*
Fontinalis minor *Linn. Eng. Bot.* t. 557.
F. alpina *Dicks.* Cr. fasc. 2. t. 4. f. 1.
Racomitrium fontinaloides *Brid.* Meth. *Dill.* Musc. t. 33. f. 2.
Gümbelia fontinaloides *C. Müller*, Syn. Musc. ii. 652.

Hab. On rocks and stones in rivulets, and on the borders of lakes, especially in hilly limestone districts.
Fr. March, April.

Growing in large tufts. Stems 3—6 inches long, with short fasciculate branches, fixed by the base only to the place of growth, floating freely in the water, or incumbent on the stones when left dry; in drier situations shorter and erect. Leaves crowded, lurid green, slightly spreading, usually twisted and flexuose while wet, and still more so when dry, more or less acute, roughish or slightly denticulate at the apex, keeled, the margin much thickened, and the strong nerve more or less excurrent; areolæ small and opaque. Perichætial leaves larger, of thinner texture, sheathing, tapering and narrow towards the point. Capsule oval, or oblong, on a very short pedicel, immersed in the perichætium, its walls rather thick, brown. Lid conico-rostrate, oblique, half as long as the capsule, its cellules spirally arranged, as in *Tortula*. Calyptra conical, coriaceous, split chiefly on one side, brownish, persistent. Peristome red, composed of about 32 filiform processes variously interlaced below, adhering to and twisted once round the columella, which in shrinking within the capsule always breaks off the upper adherent part of the peristome; when dry the teeth are incurved or straggling. Spores rather large, green. Barren-flowered plants are usually loaded with flowers, and have a very peculiar aspect.

Notwithstanding the firm texture of the leaves, it is seldom that they can be gathered uninjured when growing in streams. This singular moss is easily recognised by its abundant immersed capsules. The perfect peristome can be seldom seen, except when the plant is recent. In the 2nd edition of *Musc. Brit.* the fruit is said to be "terminal, although mostly situated on branches so short as scarcely to leave room for more than perichætial leaves." We are indebted to Bruch and Schimper for a more exact interpretation (see the remarks on the genus), and are now taught to regard this as an intermediate link between acrocarpous and pleurocarpous mosses.

A variety of this moss is found in the Thames with the leaves broader, scarcely twisted when dry, and the stems much elongated.

SUBORDER X. ENCALYPTEÆ.

29. ENCALYPTA *Schreber.* Extinguisher-Moss.

Plants caulescent, erect, branched, cæspitose, perennial. *Capsule* erect, on a long pedicel, entirely covered by a large calyptra like an extinguisher.

Stems branched, erect, beset here and there with radicles.

Leaves in five rows, more or less spreading, linear, oblong or lanceolate, or ovate-lanceolate, obtuse, acute, mucronate or piliferous, more or less crisped or twisted when dry, margin plane or reflexed, entire, or very minutely crenulate, strongly nerved; *areolæ* roundish, small and granular in the upper part of the leaf, large and diaphanous at the base. *Perichætial leaves*, properly so called, present in only one species.

Capsule on a long pedicel, erect, regular, oblong or cylindrical, smooth or striated, with an annulus. *Lid* conical at the base, with a rather long, slender, almost filiform beak. *Calyptra* cylindrico-campanulate below, longer than the capsule, rostrate, torn, crenate or fringed at the base, the fringed part at first inflexed, smooth, or rough and papillose near the apex, persistent, falling off with the lid. *Peristome* variable, in some species double, in others single, absent in others; *outer peristome* of 16 teeth, sometimes fissile, or marked with a medial line, formed of one or two series of cellules, either lanceolate, or linear, or filiform, erect, scarcely hygroscopic; *inner peristome* of an equal number of erect cilia alternating with the outer teeth and somewhat adherent to them, united in their lower half into a plicated membrane. *Vaginula* oblong-conical, purplish, crowned at the top with a conical mass of spongy cellular tissue which is at first included within the young calyptra, and at length forms the ochrea of the vaginula; from the surface of this conical mass the fringe of the mature calyptra is derived. *Spores* large or small, granular, yellowish-brown.

Inflorescence monoicous or dioicous. *Barren flower* gemmiform, axillary or terminal; *antheridia* oblong, subsessile, with longer subclavate paraphyses. *Fertile flower* terminal; *archegonia* few, with filiform paraphyses.

In the mode of growth, and in external habit, the *Encalypta* approach some of the larger species of *Tortula*. They grow on dry or moderately moist rocks, and on walls and stones, especially such as are calcareous, occasionally, also, on calcareous or marly banks, and are perennial. All the species are easily known by their habit, and by the structure of the calyptra, and constitute a very natural genus in every respect, except that they are extremely variable in the peristome. The normal number of the outer teeth appears to be 32, more or less united in pairs, and thus reduced to 16. The inner peristome exists in two species only. The absence of a peristome in some species is partly explained by the fugacity and frequent absence of that organ in *E. vulgaris*, which, when in a perfect state, has a peristome. In some of the species the teeth are inserted below the orifice of the capsule. The calyptra attains its full size before its separation from the vaginula, and even before the summit of the fruitstalk is sensibly swollen, presenting considerable analogy to the calyptra of *Funaria*. In this early stage the base of the calyptra is turned inwards and upwards upon the conical mass of spongy tissue which crowns the vaginula, and sometimes the base of the young fruitstalk within the vaginula is hooked as in *Campylopus flexuosus var torfaceus*. The fruitstalk is firm and tenacious, remaining on the stems for several seasons. Eight species are described in the *Bryologia Europæa*. Name from ενκαλυπτος, *covered with a veil.*

a. Peristome wanting.

141. 1. *Encalypta commutata* Nees and Hornsch. (*sharp-leaved Extinguisher-Moss*) ; monoicous ; stems branched, radiculose ; leaves more or less spreading and squarrose, ovate-lanceolate, acuminate, concave, slightly undulated, nerve excurrent ; capsule subcylindrical, smooth ; peristome none ; lid with a long beak ; calyptra cylindrical, laciniated or crenate at the base. (Tab. XLIV.)

- E. commutata *Nees and Hornsch.* Bryol. Germ. t. 15. f. 4. *Br. and Sch.* Bryol. Europ. fasc. 4. Monogr. p. 8. t. 1.
- E. affinis *Schwaegr.* Suppl. t. 16. (not *Hedw.*) *Bridel,* Bryol. Univ.
- E. alpina *Wahlenberg*, Eng. Bot. t. 1419.
- E. ciliata var. β. pilifera *Hook. and Tayl.* Musc. Brit. (not of *Funk.*)
- E. microphylla *Nees and Hornsch.* l. c. t. 14. f. 3.? (small state.)

Hab. Near the summits of the Scottish mountains. On Ben Lawers and other mountains in Breadalbane.

Fr. July, August.

Stems slender, about an inch long, branched, radiculose. Leaves spreading and squarrose from an erect sheathing base, sometimes recurved, erect and incurved when dry, ovate-lanceolate, somewhat concave, tapering to an acute point, the nerve more or less excurrent, margin plane, areolæ very small and opaque, upper leaves larger than the rest. Capsule smooth, of thin texture, on a reddish fruitstalk.

Peristome entirely absent. Annulus simple. Calyptra jagged and uneven at the base, but not fringed, smooth all over. Vaginula as in *E. vulgaris*, with a short conical crown of spongy tissue bordered at the base by a membrane to which the calyptra is originally attached. Barren flower either axillary, or more frequently terminal on a branch, 6-leaved, with numerous antheridia and paraphyses.

This species may always be known by its taper-pointed squarrose leaves.

b. Peristome single.

* Peristome very fugacious.

142. 2. *Encalypta vulgaris* Hedw. (*common Extinguisher-Moss*); monoicous; stems rather short, branched, radiculose; leaves spreading, oblong, elliptic-lanceolate or spathulate, apiculate or obtuse, nerve excurrent or ceasing below the apex; capsule subcylindrical, smooth; calyptra entire at the base; peristome very fugacious, often wanting. (Tab. XIII.)

E. vulgaris *Hedw.* Sp. Musc. *Schwaegr. Turner. Smith. Hook. and Tayl. Br. and Sch.* Monogr. p. 9. t. 2.
Leersia vulgaris *Hedw.* St. Cr. t. 28.
Bryum extinctorium *Linn.* Eng. Bot. t. 558. *Dill.* Musc. t. 45. f. 8.

var. β.; peristome wanting; leaves apiculate.
E. vulgaris β. lævigata *Nees and Hornsch.* Bryol. Germ. t. 14. f. 1*.

var. γ.; peristome wanting; leaves obtuse and concave at the apex.
E. vulgaris *Nees and Hornsch.* l. c. t. 14. (and var. γ. obtusa, p. 35.)
E. vulgaris γ. mutica *Bridel*, Br. Univ.
E. lævigata *Bridel*, Bryol. Univ.
E. obtusifolia *Funk. Bridel.*

var. δ.; peristome wanting; capsule oblique; leaves obtuse.

var. ε.; peristome wanting; leaves piliferous.
Encalypta pilifera *Funk.* (ex parte).

var. ξ; stem elongated; leaves larger.

Hab. On walls, banks, and rocks, chiefly such as are calcareous. Var. β. the most common form, frequent in limestone districts, near Dublin and Cork, but not frequent in Ireland; var. γ. near Youlgreave, Derbyshire, and Rhuddlan Castle, N. Wales; var. ε. near Youlgreave and Buxton, Derbyshire. The normal form very rare, found at Wellburn Mill near York, *Mr. Spruce.* Fr. March, April.

Stems scarcely ½ inch long. Leaves more or less spreading, erect and somewhat crisped when dry, more or less apiculate (or obtuse and concave at the apex in var. γ.), margin plane, crenulate or scabrous with papillæ, areolæ rather larger than in the next species; nerve strong, purplish, often more or less excurrent, at other times ceasing below the apex. Fruitstalk reddish, ½ inch long, twisting towards the right. Capsule of thin texture, pale reddish-brown, smooth when moist, but often plicated or rugose when dry, cylindrico-conical, or somewhat tapering and narrowed from the base. Annulus simple, persistent. Peristome generally absent, when present, extremely fugacious and fragile; the teeth very irregular, mostly truncated and obtuse, pale, suberect, not rising much above the orifice of the capsule. Spores rather large. Vaginula with a short broad conical crown, bordered by the membrane, which was originally continuous with the base of the calyptra. Calyptra of a greenish hue, entire at the base, papillose at the apex.

The var. γ. has longer somewhat lingulate leaves of closer texture, concave and almost cucullate at the apex, below which the nerve ceases.

Var. ε. has leaves rather short and somewhate obovate-oblong, or spathulate, the mucro or hair-point sometimes denticulate; calyptra short.

This species may generally be known by the entire base of the greenish calyptra and the smooth capsule, which, although sometimes plicate when dry, is destitute of the broad coloured ribs or striæ which characterise *E. rhabdocarpa*, and is usually without a peristome.

** Peristome persistent.

143. 3. *Encalypta ciliata* Hedw. (*fringed Extinguisher-Moss*); monoicous; stems branched, radiculose; leaves oblong-ovate or ligulate, shortly acuminate, margin recurved below, more or less spreading, crisped when dry, nerve excurrent; capsule subcylindrical, smooth; annulus none; calyptra distinctly fringed at the base. (Tab. XIII.)

E. ciliata *Hedw.* Sp. Musc. p. 6. *Web. and Mohr. Turner. Smith*, Eng. Bot. t. 1418. *Schwaegr. Nees and Hornsch.* Bryol. Germ. t. 15. f. 8. (and E. cylindrica, *Ib.* t. 6. ?) *Br. and Sch.* Monogr. p. 10. t. 3.
E. ciliata *a.* concolor *Hook. and Tayl.*
E. fimbriata *Bridel*, Meth.
Leersia ciliata *Hedw.* St. Cr. t. 19.
Bryum extinctorium *β. Linn. Dill.* Musc. t. 45. f. 9.
Bryum ciliare *Dickson* (most probably).

Hab. On rocks in the mountainous parts of England, Wales, Scotland, and Ireland. Fr. June, July.

Stems loosely tufted, about ½ inch long, or more, branched. Leaves light green, more or less crowded and spreading, undulated, and slightly crisped when dry; margin plane in the upper part, recurved below, somewhat crenulate at the apex; nerve excurrent into a slight mucro. Vaginula subcylindrical. Fruitstalk ½—¾ inch long, pale, at first bright yellow, twisting towards the left. Capsule bright chestnut-coloured, subcylindrical, very smooth, slightly constricted below the orifice, without an annulus, it walls thicker than in *E. vulgaris*. Calyptra pale-yellowish, smooth, distinctly fringed at the base, the fringe itself of laxer texture and paler than the calyptra, derived from the spongy conical mass of cellular tissue which crowns the vaginula, inflexed when moist, sometimes deciduous. Teeth of the peristome 16, inserted below the orifice of the capsule, lanceolate, with transverse bars which are somewhat prominent externally, converging when moist, erect when dry, reddish, not marked with a medial line. Spores granular. Barren flowers near the perichætium, 3-leaved, gemmiform, slightly compressed.

This species is generally known by its pale ciliated calyptra and yellow fruitstalks. The peristome, according to Bruch and Schimper, is sometimes wanting. The leaves when dry are broader and less crisped than in *E. vulgaris*, of a brighter green, and the margin distinctly recurved.

Bryum ciliare of Dickson is referred by Smith (in *Eng. Bot.*) to *Encalypta streptocarpa*, and certainly the figure of the specimen said to have been given by Dickson, warrants the opinion; but it may well be doubted whether the specimen is genuine, if we consider Dickson's own description and the synonyms cited by him, in connection with the fact that only one species was known to him at the time, and the extreme improbability of his having found *E. streptocarpa* with fruit.

144. 4. *Encalypta rhabdocarpa* Schwaegr. (*rib-fruited Extinguisher-Moss*); monoicous; stem branched, radiculose; leaves moderately spreading, crisped when dry, lanceolate or ovate-oblong, acuminate, mucronate or piliferous; capsule oblong, striated, ribbed, furrowed when dry; teeth of the peristome 16, lanceolate, firm. (TAB. XXXII.)

E. rhabdocarpa *Schwaegr.* Suppl. t. 16. *Nees and Hornsch.* l. c. t. 14. f. 2. and var. β. pilifera, *Ib.* f. 2*. *Bridel. Sturm. Br. and Sch.* Monogr. p. 13. f. 6.
E. rhaptocarpa *Hook. and Tayl. Greville,* Sc. Cr. Fl. t. 163.
E. ciliata γ. rhaptocarpa *Hook. and Tayl.* Musc. Br. ed. 1.
E. affinis *Hedw. fil.* (fide *Br. and Schimper*).

Hab. Ben Bulben, Ireland, *J. T. Mackay, Esq.* Scottish Mountains. On the Breadalbane Mountains, near the summits. Fr. July, August.

Stems ½ inch long, or more. Leaves more or less spreading, erect and very slightly twisted when dry, acuminate, sometimes piliferous, concave, the nerve mostly excurrent, sometimes ceasing below the apex, thinner and paler than in *E. vulgaris.* Vaginula rather thick, with a conical cellular crown, the crown margined or dilated at the base, as in *E. vulgaris.* Fruitstalk twisting towards the right, red. Capsule ovato-cylindrical, somewhat apophysate, reddish-brown, marked with 8—16 broad longitudinal coloured striæ, strongly ribbed when dry, and contracted below the orifice. Calyptra conico-campanulate, slightly jagged or uneven at the base, yellowish, scabrous at the apex. Annulus simple. Peristome inserted below the orifice; teeth 16, lanceolate, transversely barred, reddish, firm, sometimes marked with a medial line, erect when dry. Spores rather large, granular.

This species is distinguished from alpine forms of *E. vulgaris* (with which it is sometimes confounded) by the coloured striæ of the capsule, and the persistent peristome. The calyptra also is shorter, wider, and of a darker hue, and the leaves more acute and tapering. *E. pilifera* of Funk, according to Bruch and Schimper, consists partly of this species, and partly of a variety of *E. vulgaris.*

c. Peristome double.

Inflorescence dioicous.

45. 5. *Encalypta streptocarpa* Hedw. (*spiral-fruited Extinguisher-Moss*); dioicous; stems elongated, branched, radiculose; leaves erecto-patent, ligulate, obtuse and cucullate at the apex, nerve ceasing at or near the summit; perichætial leaves ovate at the base, subulate and tapering at the apex; capsule subcylindrical, spirally striated; teeth of the outer peristome filiform, inner peristome ciliated; calyptra laciniated at the base. (Tab. XIII.)

E. streptocarpa *Hedw.* Sp. Musc. t. 10. *Turner. Smith,* Eng. Bot. t. 2163. *Web. and Mohr. Hook. and Tayl. Nees and Hornsch.* Bryol. Germ. t. 15. *Bridel. Br. and Sch.* Monogr. p. 15. t. 7.

E. grandis *Swartz.*

Bryum ciliare *Dickson?* (fid. Smith.) *Dill.* Musc. t. 43. f. 71.

Hab. On limestone or mortared walls, bridges, &c., in shady situations, sometimes on banks in a calcareous or marly soil. Rare in fructification; in fruit on the walls of a bridge at Dunkeld. Near Youlgreave, Derbyshire, *Mr. J. E. Bowman.* Near Matlock, in several situations, *W. Wilson.* Near Bolton Bridge, Yorkshire, *Mr. John Nowell.*

Fr. August.

Stems 1—2 inches long and more, often growing in extensive patches. Leaves suberect, slightly crisped or twisted when dry, ligulate or linear, obtuse, cucullate at the apex, margin plane or slightly inflexed; nerve purplish, ceasing near the apex; upper leaves light green, lower brownish; perichætial leaves somewhat obovate at the base, lanceolato-subulate above, erect. Capsule oblong, narrower towards the top, when ripe and dry marked with 8 or 9 spiral furrows and ultimately twisted in the same direction towards the left. Annulus compound, dehiscent. Calyptra subcylindrical, rostellate, rough and spinulose at the apex, at first somewhat fringed at the base, yellowish-brown, coriaceous. Peristome inserted very little below the orifice; outer teeth 16, long, almost half as long as the capsule, narrow, nearly filiform, nodulose, marked with a medial line, confluent at the base, purplish-red, erect, when dry somewhat reflexed; inner peristome yellowish-brown, formed of ciliary processes alternating with the outer teeth, to which they rather closely adhere, and about half as long, united in their lower half into a plicated membrane. Spores small, smooth. Barren-flowered plants more slender than the fertile ones, with terminal gemmiform flowers.

This well marked species has been confounded in Drummond's *Musci Americani* (No. 48.) with *E. procera* Br. and Sch., which has monoicous inflorescence, and apiculate leaves with recurved margins. The calyptra is longer than in most of the species, and of a more subulate form; its laciniated base derived, as in *E. ciliata*, from the conical mass of spongy tissue which crowns the vaginula. The spiral ribs of the capsule are more deeply coloured and of firmer substance than the interstices. The peristome and calyptra present considerable analogy to *Schlotheimia*, an exotic tropical genus allied to the *Orthotricheæ*.

SUBORDER XI. HEDWIGIEÆ.

30. HEDWIGIA *Ehrh.*

ANŒCTANGIUM *Hook. and Tayl.* GYMNOSTOMUM *Smith.*

Acrocarpous mosses, in habit and mode of growth similar to *Schistidium*, but differing in the colour and texture of the nerveless leaves, in the conical calyptra, and in the obscure vaginula.

Stems dichotomously or irregularly branched, fragile, rooting only at the base.

Leaves crowded in eight rows, of firm texture, papillose, ovato-lanceolate, concave, nerveless, erose and diaphanous or ciliated at the apex; *areolæ* small, quadrate, elongated and subflexuose below.

Inflorescence monoicous. *Barren flowers* axillary, gemmiform; *antheridia* numerous, mixed with paraphyses. *Fertile flowers* terminal, more slender; *archegonia* few, with short rudimentary or spurious paraphyses.

Capsule immersed in the perichætium, subsessile on the vaginula, globose, without annulus and peristome. *Vaginula* small, obscure, submembranaceous. *Calyptra* small, conical, smooth, or sometimes hairy. *Lid* plano-convex, obtuse or papillate. *Spores* rather small.

Perennial, growing on rocks, in extensive incoherent patches.

146. *Hedwigia ciliata* Hedw. (*hoary-branched Beardless Moss*). (TAB. VI.)

Hedwigia ciliata *Hedw.* St. Crypt. i. t. 40. *Röhling. Br. and Sch.* Monogr. p. 5. t. 1, 2.
Pilotrichum ciliatum *C. Müller*, Syn. Musc. ii. 164.
Hedwigia anodon *Ehrh.*
Anœctangium ciliatum *Hedw.* Sp. Musc. *Turner. Schw. Funk*, Deutsch. Moose, t. 5. f. 1. *Hook. and Tayl.*
Gymnostomum ciliatum *Swartz. Smith*, Eng. Bot. t. 1179.
Gymnostomum Hedwigia *Web. and Mohr.*
Fontinalis albicans *Roth.*
Bryum ciliatum *Dicks.*
Bryum apocarpum var. β. *Linn.* Sp. Pl. *Dill.* Musc. t. 32. f. 5. A.B.

var. β. leucophæa; branches incrassated; leaves more crowded, wider, more spreading, with longer diaphanous points.

var. γ. secunda; stem procumbent, elongated, slender; leaves more distant, secund, submuticous.

Schistidium imberbe *Bridel*, Bryol. Univ. i. 118. (without the synonyms.)

var. δ. viridis; leaves spreading every way, or subsecund, less crowded, deep green, scarcely diaphanous at the apex.

var. ε. striata; leaves longitudinally plicated, their margins strongly recurved; lid conical.

Anictangium striatum *Wilson*, in Hook. Eng. Fl.

Hab. On rocks in exposed mountainous situations. Var. β. on dry calcareous rocks; var. γ. and δ. in more moist and shady places; var. η. on a detached rock by the side of Llyn Idwel, Caernarvonshire, growing with the typical form. Alva Wood, Ochills, *Mr. T. Lyle.* Fr. March.

Growing in depressed, hoary, yellowish or glaucous green, incoherent patches. Stem 1—4 inches long, or more, at first erect, afterwards procumbent and leafless below. Leaves more or less crowded, spreading, erect and imbricated when dry, often secund, ovato-lanceolate with diaphanous erose points of various length, concave, margin recurved below, nearly plane above, pale or glaucous green, papillose. Perichætial leaves larger, erect, much laciniated or ciliated at the diaphanous apex, as in those of *Diphyscium.* Capsule wholly immersed in the perichætium, globose, on a very short pedicel, yellowish-brown, reddish at the mouth, which is dilated when dry. Lid reddish, plano-convex. Calyptra naked, or hairy, conical, reddish-brown. Spores reddish-brown, almost smooth, clustered in fours while in an early stage.

The var. η. has been seen in only one station in Wales, and there sparingly, mixed with the common form; its foliage is yellowish-green, not at all glaucous, and the whole aspect of the plant is in favour of its being considered a distinct species.

31. HEDWIGIDIUM *Br. and Sch.*

ANICTANGIUM *Hook. and Tayl.*

A genus exceedingly like *Hedwigia*, but distinguished from it by Bruch and Schimper as follows:—

Stem rarely dichotomous, but irregularly branched, *stoloniferous*, sending out descending flagellæ from the side of the stem and from the extremities of the branches.

Leaves longitudinally plicate; *areolæ* more elongated.

Barren flowers terminal; *antheridia* numerous in the axillæ of the inner perigonial leaves.

Capsule more or less exserted, on a pedicel at least as long as the capsule itself, longer in some exotic species. *Lid* conico-rostellate. *Calyptra* more or less cucullate, smooth.

In deference to the authors of the *Bryologia Europæa*, we have retained this genus, though not without some doubt whether this and the preceding genus should not be united with *Braunia* into one genus: to us the differences seem to be scarcely of sufficient importance to be employed as generic characters. Three species of *Hedwigidium* are mentioned in the *Bryologia Europæa*, two of them natives of Mexico, having the habit of *Braunia.*

147. *Hedwigidium imberbe* Br. and Sch. (*green-branched Beardless Moss*); leaves widely ovato-lanceolate or ovato-acuminate, slightly erose at the apex; perichætial leaves elongated, erose at the apex, all more or less plicate, imbricated when dry, margin recurved; capsule almost exserted, subglobose; calyptra obliquely cucullate. (TAB. VI.)

Hedwigidium imberbe *Br. and Sch.* Monogr. p. 3. t. 1.
Gymnostomum imberbe *Smith*, in Eng. Bot. t. 2237.
Schistidium imberbe *Nees and Hornsch.* Bryol. Germ. t. 8. f. 4.
Anictangium ciliatum var. rufescens *Arnott*, Disp. Meth.
Anictangium imberbe *Hook. and Tayl.* (partly).
Hedwigia integrifolia *P. Beauv.*
Neckera imberbis *C. Müller*, Syn. Musc. ii. 106.

Hab. On the inclined faces of rocks. Near Glengariff, Ireland, where it was first gathered by Miss Hutchins, growing with *Hedwigia ciliata; W. Wilson.* In similar situations near Dolbadarn Castle, at the foot of Snowdon, near Beddgelert and near Llanrwst, North Wales. Fr. Oct. Nov.

Growing in extensive yellowish-green not glaucous patches. Stems 1—3 inches in length, sparingly and irregularly branched, the branches slender and rounded, when viewed in a dry state, having the foliage closely imbricated; flagelliform branches very slender, rooting at the extremity. Leaves ovato-acuminate, crowded, spreading, closely imbricated when dry, crenulate at the apex, but not white nor diaphanous, concave, more or less obscurely plicate, margin recurved. Leaves of the stolons very small, tapering, sometimes piliferous. Perichætial leaves larger, of thinner texture and more evidently plicated, erose and diaphanous at the apex. Capsule on a pedicel of its own length, at first almost spherical, subsequently obovate, truncate when dry, reddish-brown, of rather thick texture, hollow in the lower part, the sporangium not completely filling up the cavity of the capsule, but suspended to its walls by cellular fibres. Lid obliquely rostellate, nearly half as long as the capsule, yellow. Calyptra reddish, rather longer than the lid, cucullate, smooth. Barren flower at length lateral in consequence of the growth of innovations.

This moss has been much confounded with green or muticous varieties of *Hedwigia ciliata,* to which species all the North American examples mentioned in the 2nd edition of the *Muscologia Britannica* are to be referred. In general aspect *Hedwigidium imberbe* approaches very nearly to *Schistidium apocarpum*; and a small state of the moss has even been mistaken for *Daltonia heteromalla.* (See *Bryologia Europæa.*)

SUBORDER XII. GRIMMIEÆ.

32. SCHISTIDIUM *Br. and Sch.*

SCHISTIDIUM and GRIMMIA *Bridel* (partly).
GRIMMIA *Hook. and Tayl.* (partly).

Perennial, acrocarpous mosses, growing in tufts upon rocks and stones, with lanceolate leaves, immersed capsules, and conico-mitriform calyptra.

Stems erect, or when tall procumbent, repeatedly dichotomous, the innovations fastigiate, arising from below the perichætium or from the base of the stem.

Leaves in 8 rows, crowded, spreading every way or subsecund, their bases somewhat imbricated, when dry erect, gradually larger towards the top of the stem where they are more clustered, lanceolate or ovato-lanceolate and acuminate, concave below, channelled above, the margin reflexed, opaque, rather rigid, slightly hair-pointed and colourless at the apex, especially when growing in dry situations; the *nerve* roundish, prominent at the back, continued to the apex; *areolæ* roundish and dot-like, larger and diaphanous towards the base.

Inflorescence monoicous. *Barren flowers* gemmiform, axillary; *antheridia* shortly pedicellate, oblong, curved, with or without paraphyses. *Fertile flowers* more slender; *archegonia* with long styles and few or no paraphyses.

Fruit solitary. *Capsule* immersed in the perichætial leaves, obovate or roundish, with a wide mouth, smooth, on a very short fruitstalk. *Vaginula* short. *Lid* convex, shortly rostellate or apiculate. *Calyptra* small, conical, dilated and laciniated at the base, scarcely covering the lid. *Annulus* scarcely any, or altogether wanting. *Peristome* single; *teeth* 16, inserted below the orifice of the capsule, rather large, lanceolate, transversely barred, without a medial line, often perforated or cribrose in the upper part, the bars somewhat prominent externally, granulose, deep red or orange, slightly hygroscopic, in one species quite rudimentary. *Columella* falling away in union with the lid. *Spores* small, smooth, yellowish-brown.

Schistidium is nearly allied to *Grimmia*, and, indeed, differs in very little more than the adhesion of the columella to the lid and the subsessile immersed capsule. In aspect it resembles *Coscinodon*, and some species of *Orthotrichum;* it has, also, some analogy to the *Hedwigieæ*. Four species are described in the *Bryol. Europæa*. Name from σχιζω, *I split*, in allusion to the laciniated base of the calyptra.

48, 1. *Schistidium confertum* Br. and Sch. (*close-tufted Grimmia*); densely cæspitose; leaves ovato-lanceolate, acuminate, the upper ones shortly hair-pointed; capsule oval or roundish; lid shortly rostellate; teeth of the peristome much perforated and cribrose; annulus none. (TAB. XLIV.)

Bryol. Europ. Monogr. p. 7. t. 2.

Grimmia conferta *Funk*, Moos. Tasch. p. 18. t. 12. *Nees and Hornsch.* Bryol. Germ. t. 19. f. 5.

G. glacialis *Nees and Hornsch.* l. c. t. 19. f. 6. G. fusca *Ibid.* f. 7.

G. cribrosa *Funk MS.*

G. pulvinata *Swartz*, in Herbar.

G. apocarpa δ. conferta *C. Müller*, Syn. Musc.

var. β. urceolare; leaves with very short white points; capsule urceolate.

G. urceolaris *Bryol. Germ.* l. c. f. 8.

var. γ. obtusifolium; leaves all obtuse, shorter, and broader.

Hab. On trap or sandstone rocks. Found several years ago in the King's Park, near Edinburgh, by *Mr. T. Drummond:* recently gathered there by *Dr. Greville.* Fr. Feb., March.

Exceedingly like *Schistidium apocarpum*, but differing as follows:— Stems more compactly tufted, with the foliage of an intense green colour above, blackish below, more slender, more flaccid when moist, rigid and fragile when dry. Leaves erect and lurid when dry, the margin less recurved and somewhat thickened, areolæ closer; nerve stronger, more prominent and dilated at the back, and more deeply and acutely channelled above, so as to seem divided by a dark medial line. Capsule smaller, paler, of thinner texture, and almost pellucid. Teeth of the peristome cribrose and lacerated, seldom entire, pale bright red or orange colour, fragile and fugacious. Lid more shortly rostrate.

149. 2. *Schistidium apocarpum* Br. and Sch. (*sessile Grimmia*); loosely cæspitose; leaves spreading from an erect base, the upper ones with white points, margin recurved; perichætial leaves broader, thinly nerved; capsule elliptical, of thick texture; annulus none; lid rostellate; teeth of the peristome entire or perforated, dark red. (TAB. XIII.)

Bryol. Europ. Monogr. p. 7. t. 3, 4.

Grimmia apocarpa *Hedw.* St. Cr. t. 39. *Turner. Smith*, Eng. Bot. t. 1134. *Web. and Mohr. Schwaegr. Hook. and Tayl. Nees and Hornsch.* Bryol. Germ. t. 16. f. 4. *C. Müller*, Syn. Musc.

G. fusca and robusta *Nees and Hornsch.* l. c. t. 19. f. 7. & t. 20. f. 9.

G. strigosa *Bridel. Dill.* Musc. t. 32. f. 4.

var. β. gracile; stem longer, slender, decumbent; leaves spreading every way or subsecund; perchiætial leaves secund.

G. apocarpa γ. Schleicheri *Bridel.*

G. apocarpa γ. gracilis *Nees and Hornsch.* l. c. t. 17. f. 4. h. i. k.

G. gracilis *Schwaegr.* Suppl. t. 23.

G. trichodon *Bridel.*

var. γ. rivulare ; loosely cæspitose ; stems somewhat fasciculate, elongated; leaves wider, dark green, ovato-lanceolate, rather obtuse ; capsule turbinate.

G. apocarpa var. δ. rivularis *Nees and Hornsch.* l. c. t. 18. f. 4. l.

G. rivularis *Schwaegr.* Suppl. t. 23. *Turner*, Musc. Hib. t. 2. f. 2. *Smith*, Eng. Bot. t. 1345.

subvar. γβ. alpicola ; cæspitose ; stems shorter, suberect.

G. apocarpa var. ε. alpicola *Nees and Hornsch.* l. c. t. 18. f. 4. m.

G. alpicola *Swartz*, Musc. Suec. t. 1. *Hedw.* Sp. M. t. 15. *Turner. Smith*, Eng. Bot. t. 2226.

var. δ. stricta ; stem elongated ; leaves more rigid, reddish-brown.

G. stricta *Bridel. Turner*, Musc. Hib. t. 2. f. 1. *Eng. Bot.* t. 1963.

G. apocarpa β. stricta *Nees and Hornsch.* l. c. t. 17. f. 4. g.

Hedwigia nervosa *P. Beauv.* Schistidium nervosum *Bridel.*

Hab. On rocks and walls ; seldom on trees. Var. β. in dry exposed situations, chiefly on calcareous rocks ; var. γ. by rivulets ; subvar. γβ. on wet stones in alpine rivulets ; var. δ. on alpine rocks. Fr. Nov., Feb.

Stems $\frac{1}{2}$—1 inch long, and more; the larger ones dichotomously branched and often procumbent, usually erect, robust, or slender. Leaves more or less crowded, spreading and recurved, or inflexed; erect, scarcely crisped when dry, variable in shape and size, lower ones ovato-lanceolate and acuminate, upper ones larger and more dilated below, usually with white points, margin strongly recurved; perichætial leaves still larger, of thinner texture, with a thinner nerve, with or without white points. Capsule firm and opaque, shortened and wide-mouthed when dry. Calyptra about 5-parted at the base. Lid convex, with a rather short inclined beak. Teeth of the peristome inserted below the orifice of the capsule, rather large, half as long as the capsule, lanceolate, with several transverse bars, sometimes perforated, spreading outwards when dry, dark red.

According to Bruch and Schimper, the varieties are simply dependent on local and accidental causes for their several characters, which are therefore not at all well marked. Var. *rivularis* has the leaves wider, dark green, more crisped when dry, the nerve stronger and dark coloured ; var. *alpicola* is only a more alpine and dwarfish form of var. *rivularis ;* and even var. *stricta* is only a modification of the last, verging towards the typical form.

Dr. Taylor (in *Flora Hib.*) mentions a variety with capsules higher than the perichætia, found at the Dargle, near Dublin.

150 3. *Schistidium maritimum* Br. and Sch. (*sea-side sessile Grimmia*) ; densely tufted ; leaves crowded, rigid, longer, erecto-patent, straight, incurved when dry, lanceolate, acuminate, carinate, with a strong excurrent nerve, margin nearly plane ; capsule pale, obovate-truncate ; annulus none ; lid ros-

tellate; teeth of the peristome large and cribrose. (TAB. XIII.)

Bryol. Europ. Monogr. p. 10. t. 5.
Grimmia maritima *Turner*, Musc. Hib. t. 3. f. 2. *Smith*, Eng. Bot. t. 1645. *Schwaegr.* Suppl. t. 22. *Hook. and Tayl.* *Nees and Hornsch.* Bryol. Germ. t. 18. f. 4. o. *Bridel.* *C. Müller*, Syn. Musc.
G. alpicola δ. *Wahlenb.* Fl. Lapp.

Hab. On rocks near the sea; seldom, if ever, on such as are calcareous. Fr. Nov., Dec.

Growing in dense tufts of a dull green or brownish colour, scarcely an inch in height. Leaves longer, narrower, and much more rigid than in the preceding species, never hair-pointed, when dry more or less incurved, glossy, and of almost horny consistence; margin plane, except near the base, where it is slightly reflexed; nerve very strong, reddish-brown, and in the perichætial leaves especially, excurrent. Perichætial leaves longer than in the preceding, their margins quite plane, much incurved when dry. Capsule softer, and of a brighter tint. Teeth of the peristome larger, much perforated. Vaginula longer. Spores twice as large. A more robust species than the preceding, distinguished by its rigid, strongly nerved leaves.

33. GRIMMIA *Ehrh.* *Br. and Sch.*

GRIMMIA *Hook. and Tayl. &c.*
TRICHOSTOMUM *Hook. and Tayl.* (partly).
DRYPTODON *Bridel* (partly).

Perennial mosses, allied on the one hand to *Schistidium*, and on the other to *Racomitrium*, growing upon rocks and walls, sometimes in compact tufts, sometimes loosely and irregularly cæspitose, chiefly alpine. *Capsule* either immersed, and shortly pedicellate, or exserted, erect, cernuous or pendulous, on a straight or curved pedicel. *Calyptra* mitriform or dimidiate.

Stem erect or decumbent at the base, with a pair of innovations from below the perichætium; hence dichotomously branched and fastigiate.

Leaves in 8 rows (disp. $\frac{3}{8}$), semiamplexicaul and imbricated at the base, spreading in the upper part, recurved or inflexed, when dry erect and sometimes contorted; upper ones the largest and tufted at the summit of the stem; lanceolato-acuminate, opaque, smooth on both sides, concave and channelled, margin somewhat thickened, plane or recurved, entire, more or less white-pointed or piliferous, rarely muticous, the nerve vanishing near the apex, which is usually spinulose or denticulate; *areolæ* dense, dot-like, larger and diaphanous below.

Inflorescence monoicous or dioicous. *Flowers* at first terminal. *Barren fl.* at length lateral, gemmiform.

Fruit solitary. *Calyptra* mitriform, 5-lobed at the base or dimidiate, reaching below the lid. *Capsule* on a shorter or longer pedicel (which is either straight, flexuose, or much curved), regular, rarely ventricose, ovate, oval, or oblong, smooth or striated. *Lid* convex and apiculate, or conico-rostrate, shorter than the capsule. *Annulus* simple or compound, rarely absent. *Peristome* variable (absent in one species); *teeth* 16, rather large, lanceolate, convex externally, and trabeculated, cribrose, bi-trifid, spreading or suberect when dry, purplish, pale red or yellowish-brown, slightly hygroscopic. *Columella not deciduous, shrinking into the ripe capsule. Spores* rather small, smooth. *Vaginula* oblong or conical.

This genus chiefly differs from *Schistidium* in the want of strict adhesion of the columella to the lid. Twenty-five species are included in the *Bryologia Europæa.* Name in honour of Grimm, a German botanist.

TRIBE I. CURVISETÆ.

SECT. I. PULVINATÆ.

Monoicous.

157. 1. *Grimmia pulvinata* Smith (*grey-cushioned Grimmia*); densely tufted; leaves elliptic-lanceolate, suddenly attenuated and piliferous, carinate, with recurved margins; capsule drooping on a curved fruitstalk, oval, 8-furrowed; lid convex at the base, rostrate; calyptra mitriform, lobed at the base; teeth of the peristome densely barred, bi-trifid at the apex, dark red; annulus large and dehiscent. (TAB. XIII.)

G. pulvinata *Smith,* in Eng. Bot. t. 1728. *Hook. and Tayl. Bruch and Shimp.* Monogr. p. 12. t. 4.
Dicranum pulvinatum *Turner. Smith,* Fl. Brit. *Schwaegr.*
Trichostomum pulvinatum *Web. and Mohr.*
Dryptodon pulvinatus *Bridel.* (Campylopus *Brid.* Meth.)
Fissidens pulvinatus *Hedw.* Sp. Musc. t. 40.
Leersia pulvinata *Hedw.* Fund. Musc. t. 10. f. 65.
Bryum pulvinatum *Linn. Dill.* Musc. t. 50. f. 65. (except D. & E.)

var. β. obtusa; stem shorter; capsule on a shorter pedicel, shortly oval; lid conical, obtuse or mamillated, short; teeth of the peristome shorter.

Fissidens pulvinatis β. africanus *Hedw.* Sp. Musc. t. 40.
Dryptodon obtusus *Bridel.*

Hab. On walls, roofs, and rocks; var. β. on dry exposed rocks. St. Vincent's rocks, near Bristol, *Mr. Thwaites.* Conway Castle rock. Fr. March, April.

Growing in dense rounded hoary tufts, ½—1 inch high. Stems branched, rooting at the base. Leaves more or less spreading, when dry erect and slightly bent, crowded, ovate-oblong or elliptic-lanceolate, suddenly terminated by long white hair-points, carinate, margin recurved, entire, nerve vanishing below the hair-point. Perichaetial leaves larger and longer, erect, concave, more thinly nerved. Fruitstalk longer than the perichætium, arcuate and much bent, brownish, erect and twisted to the left when dry. Capsule of a dull reddish-brown colour, 8-ribbed when dry, its walls rather thick and opaque, drooping and usually concealed by the leaves when growing. Lid with a straight beak, conical below, about half as long as the capsule. Calyptra about 5-lobed at the base. Annulus quickly unrolled after the fall of the lid, large, compound. Teeth of the peristome often cloven at the apex; hence confounded at one time with *Dicranum;* lanceolate, deep purplish-red, more or less spreading when dry. Spores small, rusty red.

The var. β., originally found at the Cape of Good Hope, differs merely in the short lid, and more perforated and ragged teeth: it has been often confounded with the next species which is very distinct.

152. 2. *Grimmia orbicularis* Br. and Sch. (*round-fruited Grimmia*); stems densely tufted; leaves crowded, oblong-lanceolate, hair-pointed; capsule drooping, on a pale curved fruitstalk, roundish, faintly striated; lid short, mamillated; annulus narrow; teeth of the peristome perforated, trifid, distantly barred; calyptra dimidiate. (TAB. XLIV.)

G. orbicularis *Bryol. Europ.* Monogr. p. 13. t. 5. Eng. Bot. Suppl. t. 2888.
Gümbelia orbicularis *C. Müller*, Syn. Musc. i. 775.
Dryptodon obtusus *Bridel*, Bryol. Univ. (ex parte).

Hab. Calcareous rocks. Ormeshead, N. Wales, 1826, *W. Wilson.* St. Vincent's rocks, near Bristol, *Mr. Eagle* and *Mr. Thwaites.* Fr. Feb. March.

This elegant species differs from *G. pulvinata*, as follows:— Leaves narrower, the marginal cellules at the base enlarged, more lurid. Fruitstalk pale yellow. Capsules smaller, roundish, passing from yellow to bright red as it ripens, smooth and glossy while recent, obscurely ribbed when dry, the walls of thinner texture and less opaque, without a blackish border at the orifice; annulus much narrower; lid very short, never rostellate, scarcely apiculate. Teeth of the peristome paler red, shorter and broader, less opaque, more distinctly and distantly marked externally with transverse bars, trifid, sometimes quadrifid, at the apex, and much perforated or cribrose below, erect or converging when dry. Calyptra dimidiate, not mitriform, soon falling away.

It sometimes grows intermixed in the same tuft with the preceding species, and ripens its fruit at an earlier period.

SECT. II. *Stems tufted, slender; leaves lanceolate, acuminate, piliferous; inflorescence dioicous; capsule small, smooth, or striated.* TRICHOPHYLLÆ.

153. 3. *Grimmia spiralis* Hook. and Tayl. (*spiral-leaved Grimmia*); stems elongated, slender, pulvinate; leaves lanceolate, tapering into long diaphanous hair-points, erecto-patent, spirally imbri-

cated when dry; fruitstalk curved; capsule small, ovate, nearly smooth (8-angled when dry, *Br. and Sch.*); lid short, obtuse; annulus compound. (Tab. XXXII.)

Grimmia spiralis *Hook. and Tayl.* in *Drummond* Musc. Scot. vol. ii. No. 29. *Greville*, Scot. Cr. Fl. t. 203. *Br. and Sch.* Bryol. Europ. Monogr. p. 14. t. 7.
Grimmia cernua *Nees and Hornsch.* Bryol. Germ. t. 24.
Trichostomum funale *Schwaegr.* Suppl. t. 37. (according to authentic specimens from the author).
Dryptodon spiralis *Bridel*, Bryol. Univ. i. p. 772.
Dryptodon funalis *Ib.*

Hab. On dry exposed alpine rocks. East side of Slemish Mountain, county of Antrim, Ireland. On Ben Lawers, and other mountains in Breadalbane. Grampian Mountains, *Drs. Arnott and Greville.* Clova, *Mr. Drummond.* Snowdon. Westmoreland, *Mr. Borrer.* Teesdale, *John Nowell.* Rare in fruit. Fr. Sept. Oct.

Growing in dense large tufts, but readily falling asunder when detached from its native rock; ½—1½ inch or more in height, very slender, almost filiform, somewhat fragile, more or less branched, and not unfrequently bearing flagelliform lateral shoots. Leaves slightly spreading, incurved above the middle, the margin somewhat recurved, upper leaves only with hair-points, when dry spirally imbricated or contorted round the stem. Perichætial leaves longer, broader, concave, also piliferous. Fruitstalk shorter than the perichætium, curved, pale yellow. Capsule small, ovate or obovate, pale reddish-brown, with 8 often inconspicuous furrows, which are more evident in the dry capsule. Calyptra conico-mitriform, 5-lobed at the base. Lid apiculate, scarcely rostellate, short. Annulus compound, dehiscing in fragments. Teeth of the peristome bifid, purplish-red, recurved when dry.

Var. β. of Bruch and Schimper, with the leaves of the branches fasciculate and scarcely oblique when dry (growing in moist shady situations), has not been observed in Britain. This variety is said to resemble *Grimmia incurva* Schwaegr., and differs from the typical form in the longer, more patent, straggling leaves, which are not spirally contorted when dry, and are more shortly hair-pointed, approaching in these and other characters to *G. trichophylla*, and still more nearly to *G. uncinata* Kaulf, with which it has been confounded by Nees and Hornsch. in *Bryol. Germ.* *Grimmia apiculata* Hornsch. differs from *G. spiralis* in the shorter, thicker stems; leaves narrower, shortly hair-pointed; capsule quite smooth; annulus larger and more freely dehiscent; teeth of the peristome usually perforated; inflorescence monoicous.

The specimens of *Trichostomum funale* received from Dr. Schwaegrichen agree well with authentic specimens of *G. cernua*, and are by no means identical, as Bruch and Schimper suppose them to be, with *G. funale* Bryol. Europ., a moss which for various reasons we refer to *Driptodon Schultzii* Bridel (*Bryol. Univ.*). The figure of *Trichostomum funale* Schwaegr. (Suppl. t. 37.) represents the capsule rather more strongly furrowed or ribbed than we find it to be in the specimens, but these are not in a good state for examination, being much over-ripe. Nees and Hornschuch (*Bryol. Germ.*) make *G. spiralis* a var. β. of their *G. cernua*, having the leaves more incurved and spirally contorted than in their typical specimens, and the stem less slender; a distinction which appears to be of no real importance.

154. 4. *Grimmia torta* Hornsch. (*twisted-leaved Grimmia*); stems elongated, densely tufted, soft and very flexible; leaves lanceolate, carinate, acuminate, the upper ones scarcely piliferous, all of them spirally twisted when dry. (Tab. XXXII.)

Grimmia torta *Nees and Hornsch.* Bryol. Germ. t. 24. f. 24.
G. torquata *Greville,* Scot. Crypt. Fl. t. 199. (fig. good). *Hook. and Tayl.* tab. xxxii.
Dryptodon torquatus *Bridel,* Br. Univ. i. 772.

Hab. Alpine rocks, plentiful, but always barren. Scotland. Ireland. Wales. Westmoreland, *Mr. Borrer.* Teesdale, *John Nowell.*

The manifest affinity between this and the preceding induces us to retain this moss in the genus *Grimmia*, from which it is excluded in the *Bryologia Europæa*, the authors of that work having considered it rather to belong to *Zygodon.* It is a more robust species than *G. spiralis*, but grows like that in incoherent tufts, of a rich olive-brown colour, the stems quite flaccid when moist, 1—2 inches long, dichotomously branched and fastigiate. Leaves 3-ranked, moderately spreading, more or less crowded, spirally contorted when dry, acutely carinate, channelled along the nerve, so as to be almost conduplicate, the margin slightly reflexed, occasionally though rarely tipped with a very short diaphanous point, areolæ dot-like.

The more or less crowded state of the foliage gives the plant quite a different aspect when dry, so that two species might be at first supposed to be included under the same name. No flowers have been observed at any time; but jointed filaments, at times adhering to the back of a leaf, are frequently found among the leaves near the top of the stem.

155. 5. *Grimmia trichophylla* Greville (*hair-pointed Grimmia*); stems loosely tufted; leaves spreading, lax, flexuose, linear-lanceolate, gradually tapering into a diaphanous point, their margins recurved; fruitstalk curved; capsule elliptical, furrowed; lid rostrate; annulus large; teeth of the peristome bifid. (Tab. XXXII.)

G. trichophylla *Greville,* Scot. Cr. Fl. t. 100. *Hook. and Tayl. Bridel,* Bryol. Univ. i. 188. *Br. and Sch.* Monogr. p. 16. t. 9. (not G. Schultzii *Brid.*)
Campylopus affinis *Hornsch. MS.*
Dicranum pulvinatum β. argentatum *Turn.* Musc. Hib. t. 3. f. 1.
Dryptodon trichophyllus *Bridel,* Br. Un. i. 771.

Hab. Discovered in Scotland by Dr. Greville, on stone walls near Edinburgh. Not unfrequent in similar situations throughout Britain, but not common in fruit. Ireland, *Dr. Taylor.* Fr. April, May.

Growing in soft, lax, incoherent patches of a yellowish or green colour. Stems ¼—1 inch long, rooting at the base only. Leaves spreading from an erect base, incurved towards the apex, somewhat flexuose, slightly crisped when dry, margin nearly plane above, recurved below. Fruitstalk longer than the perichætial leaves, yellowish, curved; when dry flexuose and nearly erect. Capsule elliptical or ovate-oblong, its walls rather thin, furrowed or angular when dry, pale brown. Lid with a rather long straight beak. Annulus large and dehiscent. Calyptra conico-mitriform, lobed at the base. Teeth of the peristome densely barred, bifid, sometimes entire.

Distinguished from *G. pulvinata* by the gradually tapering leaves and lax tufts, and from *G. Schultzii* (of Bridel, not Br. and Sch.) by the dioicous inflorescence, more slender stems, and less crowded foliage.

SECT. III. *Taller, cæspitose, robust; leaves longer, piliferous, or obtuse; capsule larger, furrowed, or smooth; lid with a long beak.* ELATIORES.

a. Inflorescence monoicous.

16. 6. *Grimmia Schultzii* Bridel (*Schultz's Grimmia*); stems tufted; leaves crowded, lanceolate, subsecund, gradually tapering into a long rough diaphanous point, their margins recurved; fruitstalk curved, shorter than the perichætium; capsule shortly elliptical or obovate, furrowed; annulus very large; teeth of the peristome longer, deeply bifid. (TAB. XLIV.)

Dryptodon Schultzii *Bridel*, Bryol. Univ. i. p. 199.
Trichostomum decipiens *Schultz*.
Trichostomum patens β. piliferum *Hook. and Tayl.* (not T. funale *Schwaegr.*).
Grimmia funalis *Br. and Sch.* Monogr. p. 17. t. 11.

Hab. On subalpine rocks, not frequent: in Scotland, Wales, Cornwall, &c. Fr. April, May.

This is a more robust species than *G. trichophylla;* the leaves more crowded, subsecund and spreading, larger, more erect, their long rough glossy hair-points spreading outwards when dry, their margins more strongly recurved; fruitstalk shorter; capsule thicker and shorter; teeth longer, more tapering, more deeply cloven, red; annulus broader; inflorescence monoicous, the barren gemmiform flowers being constantly found in the vicinity of the perichætium. By this last character it differs from *G. elatior* Br. and Sch. (*Trichostomum incurvum* Hornsch.), an alpine dioicous species not found in Britain, having longer decumbent stems.

The teeth of *G. Schultzii* are so very long and slender, that the upper portion usully breaks off and remains attached to the fallen lid. We can by no means concur with Bruch and Schimper in uniting this moss to *Trichostomum funale* of Schwaegrichen, which differs in the slender stem and short lid, and is, in fact, *Grimmia spiralis.* We have ascertained the identity of our moss with a specimen of *Trichostomum decipiens* Schultz in the *Hookerian Herbarium;* and it is evident that Bridel himself never considered *Grimmia trichophylla* to be the same as *Dryptodon Schultzii;* for he describes the former of these as a *Dryptodon* (*Bryol. Univ.* i. p. 771.) without any doubt of its being a distinct species, having previously inserted it in the genus *Grimmia* in the same work. It is quite distinct from *Trichostomum patens* of Hooker and Taylor, which is the succeeding species.

b. Inflorescence dioicous.

157. 7. *Grimmia patens* Br. and Sch. (*tall alpine Grimmia*); stems elongated, cæspitose, leafless towards the base; leaves spreading every way, or subsecund, lanceolato-oblong, muticous, the nerve dorsally 2-winged; perichætial leaves shorter than the rest; fruitstalk curved; capsule furrowed when dry; annulus large; teeth of the peristome long and bifid. (TAB. XIX.)

Grimmia patens *Br. and Sch.* Monogr. p. 18. t. 10. 2.
Trichostomum patens *Schwaegr.* Suppl. t. 37. *Hook. and Tayl.*
Dicranum patens *Smith*, Eng. Bot. t. 1990.
Bryum patens *Dickson*, Cr. Fasc. 8. t. 4. f. 8.
Trichostomum obtusum *Smith. Dill.* Musc. t. 47. f. 30. ? (compare Grimmia atrata).
Dryptodon patens *Bridel*, Br. Univ. i. 192.

Hab. On shady or moist alpine rocks, in Scotland, Wales, and Ireland. Fr. April, May.

Growing in large green or brownish patches. Stems 2—4 inches long, and more, decumbent at the base, branched and fastigiate, denuded of leaves in the lower part. Leaves carinate, of firm texture, erect and rigid when dry, not very acute, rather glossy, margin recurved below, the stout nerve curiously 2-winged at the back; by which mark the species, even in a barren state, may be easily recognised; areolæ sinuous as in *Racomitrium;* perichætial leaves shorter, wider below, and somewhat sheathing. Capsule on a pale, rather short, curved fruitstalk, pale brown, smooth at first, but when dry distinctly furrowed. Annulus large and distinct. Lid with a rather long beak, which is sometimes oblique. Calyptra usually 5-lobed at the base. Teeth of the peristome long, confluent at the base, bi-trifid, the segments at first united towards the apex, externally marked with prominent bars, somewhat incurved when dry.

The dioicous inflorescence, and muticous leaves, with the 2-winged nerve, abundantly distinguish this from the preceding species. The capsules are usually lateral in consequence of the growth of innovations, and are thus liable to escape observation.

We coincide with Bruch and Schimper in placing this moss near the preceding species rather than with *Racomitrium sudeticum* (*Trichost. microcarpum* of H. & T.). They justly remark, that scarcely any family of mosses presents such difficulties in the way of natural classification of the species as the *Grimmiaceæ.*

TRIBE II. RECTISETÆ.

SECT. I. *Stems tufted; leaves piliferous; calyptra conico-mitriform, lobed at the base.* LEUCOPHÆÆ.

a. Inflorescence monoicous.

58. 8. *Grimmia Donniana* Smith (*Donn's Grimmia*); stems short, tufted; leaves erecto-patent, narrowly lanceolate, gradually tapering into diaphanous hair-points, margin plane; capsule erect, subexserted, oval-oblong; lid short, conical, obtuse; annulus small, persistent; teeth of the peristome entire or perforated. (TAB. XIII.)

Grimmia Donniana *Smith,* Fl. Brit. (1804) p. 1198. Eng. Bot. t. 1259. (fig. not good). *Web. and Mohr,* Bot. Tasch. p. 131. *Nees and Hornsch.* Bryol. Germ. v. 2. pt. 1. p. 128. t. 20. f. 10. *Hook. and Tayl.*

G. obtusa *Schwaegr.* Suppl. (1811) i. 1. 88. t. 25. *Nees and Hornsch.* Bryol. Germ. ii. 1. 135. t. 20. f. 11. *Bridel. Br. and Schimp.* Monogr. p. 20. t. 13.

Dicranum ovale *Smith,* in Eng. Bot. t. 2165. (as to the smaller specimen and magnified capsule).

var. β. sudetica; leaves with longer hair-points; capsule immersed; lid conico-acuminate.

G. sudetica *Schwaegr.* Suppl. i. 87. t. 24. *Nees and Hornsch.* l. c. p. 128. t. 20. f. 10. b. (according to the correction of the authors, and of Prof. Arnott). *Br. and Sch.* Monogr. t. 20. fig. β. 1., β. 1. b., β. 3.

var. γ. elongata; leaves almost muticous or very shortly hair-pointed; capsule exserted, on a longer pedicel.

G. obtusa β. elongata *Bryol. Germ.* l. c. t. 20. f. 11. b.

Hab. On rocks and walls, in mountainous districts, near Forfar, *G. Donn.* Abundant near Llyn Ogwen, Caernarvonshire, and elsewhere about Snowdon; Kinder Scout, Derbyshire, &c.; var. β. Sidlaw Hills, Scotland, *Mr. W. Gardiner;* var. γ. not found in Britain. Fr. March, April, Oct.

Growing in small, round, hoary tufts. Stems seldom above ¼ in. long, branched. Leaves rather long and narrow, erecto-patent, when dry erect and slightly flexuose, not much crowded, dark green, the roughish hair-points scarcely half the length of the entire leaf, carinate, margin not reflexed, but slightly thickened as in most of the other species; nerve well-defined, prominent at the back, continued to the hair-point. Perichætial leaves longer, their hair-points in the var. β. overtopping the capsule. Capsule quite erect, oval-oblong, pale yellowish-brown, its walls rather thin. Annulus rather small (broad according to Br. & Sch.), persistent. Lid seldom more than one third of the length of the capsule, conical, more or less obtuse, sometimes slightly apiculate, entire, without any marginal groove for the annulus. Teeth of the peristome rather broad, densely barred, entire, or sometimes perforated, rarely bifid.

This is a smaller species than *G. ovata,* for which it has been often mistaken, and is distinguished by its plane-margined, lax, and somewhat flaccid leaves, pale capsule, and short blunt lid.

We retain the name applied by Smith (in commemoration of George Donn, the discoverer) as being of older date than that of Schwaegrichen, who erroneously considered *G. Donniana* to be the same form or species as his *G. sudetica.* The two forms have been much confounded, and we venture to dissent (if indeed we do differ) from the authors of the *Bryologia Europœa* in regarding *G. sudetica* (as figured and described by Schwaegrichen, and by Nees and Hornsch.) to be that form which has an immersed capsule and conico-acuminate lid, differing quite from our British moss, which has the capsule usually even more exserted than in authentic specimens of *G. obtusa*, but not otherwise unlike those specimens, except in having the dry foliage more lax and somewhat flexuous, the lid being equally short and obtuse in both. The figure β., in the *Bryologia Europœa*, intended for *G. Donniana*, exactly accords with our idea of *G. sudetica*, showing the conico-acuminate lid as well as the immersed capsule, but at variance with the definition there given as to the lid. Schleicher's specimen, called " *G. sudetica* ex Valle Salvan," in *Herb. Hook.* is *G. obtusa*, and, like one equally misnamed from Dr. Hornschuch, has the capsule exserted.

159. 9. *Grimmia ovata* Web. and Mohr (*oval-fruited Grimmia*); stems more or less elongated, branched, tufted; leaves spreading, erect when dry, lanceolate, tapering, hair-pointed, margin recurved below; capsule exserted, of firm texture, erect, oval; annulus large, dehiscent; lid rostellate, grooved in the margin; teeth of the peristome narrow, bifid. (TAB. XIII.)

G. ovata *Web. and Mohr*, It. Suec. t. 2. f. 4. *Schwaegr.* Suppl. t. 24. Bryol Germ. l. c. t. 21. f. 15. *Bridel. Hook. and Tayl. Br. and Sch.* Monogr. p. 21. t. 17, 18.

G. sciuroides *Bryol. Germ.* t. 22. f. 17., and G. patens, t. 21. f. 14.

Dicranum ovale *Turner? Smith*, Eng. Bot. t. 2165. as to the larger specimen only (not *Hedwig*).

Bryum ovale *Dickson. Dill.* Musc. t. 50. f. 65. D. E.

var. β. affinis; more robust; capsule on a shorter pedicel, scarcely exserted; leaves with longer hair-points. *Bryol. Germ.* t. 21. f. 13.; and var. ramossissima, f. 13. b.

var. γ. obliqua; capsule inclined. *Bryol. Germ.* t. 22. f. 16.

var. δ. cylindrica; capsule longer, subcylindrical. *Bryol. Germ.* t. 23. f. 18.

Hab. On alpine rocks. Breadalbane and Clova mountains. On Snowdon, N. Wales, but rare. Swithland Slate Pits, Charnwood Forest, *Rev. A. Bloxam.* Fr. Oct., March.

Stems more or less compactly tufted, ½ inch long or more, branched and fastigiate. Leaves more crowded than those of *G. Donniana*, of firmer texture, more opaque, more erect when dry, the margin in the lower part recurved, the nerve broader, but less defined and less prominent at the back; perichætial leaves more erect and sheathing; capsule of a darker hue, reddish-brown, of firmer substance, and usually on a longer pedicel; annulus larger, lodged in a groove on the margin of the lid, which is longer and more or less rostellate. Teeth of the peristome cloven and perforated. Inflorescence monoicous, rarely synoicous.

This species is usually larger and more rigid than *G. Donniana;* and the leaves of firmer texture with recurved margins, with the grooved lid, will always distinguish it from that species. It has been often confounded with *G. commutata* of Huebener (*Dicranum ovale* of Hedwig), which is dioicous, and has a dimidiate calyptra, and leaves with inflexed margins: of this we have seen no British example. It is placed by Bruch and Schimper in a separate section (*Commutatæ*) with *G. montana*, *alpestris*, and *sulcata*, all of which have the same inflorescence and calyptra.

G. Donn's specimens, called *Dicranum ovale* in *Herb. Turner*, belong partly to *G. Donniana*, and partly to this species: both appear to have been figured at t. 2165. of *Eng. Bot.*

b. Inflorescence dioicous.

140. 10. *Grimmia leucophæa* Greville (*hoary Grimmia*); stems rather short, tufted; leaves spreading, erect, imbricated when dry, ovate or ovate-oblong, concave, with long hair-points, margin plane; capsule exserted, erect, elliptical or oblong; lid short, conico-rostellate; annulus large, dehiscent; teeth of the peristome bifid and perforated. (Tab. XXXIII.)

G. leucophæa *Greville,* in Wern. Trans. 4. t. 6. *Scot. Crypt. Flora,* t. 284. *Hooker and Tayl. Schwaegr.* Suppl. t. 306. *Br. and Schimp.* Monogr. p. 13. t. 20.

Grimmia lævigata *Bridel* (Campylopus lævigatus *Brid.* Meth.) according to Bruch and Schimper, who have inspected the original specimens: the description partly erroneous in *Bryol. Univ.* i. 184.

Dryptodon leucophæus *Bridel,* Br. Univ. i. 773.

Grimmia campestris *Hook.* Musc. Exot. t. 129.

Dicranum piliferum *Schleich.* Cat. (according to Prof. Arnott).

Hab. King's Park, Edinburgh, on trap rocks, &c.; "first discovered there by *R. Brown, Esq.;*" gathered there in April, 1803, by *G. Donn*, as new (see *Herb. Turner*). At Fairhead, on basalt. Coast of Fife, *Prof. Arnott.* Salcombe, Devonshire, *Mrs. Griffiths.* Abbey Craig, near Stirling, *Mr. Lyle.*

Fr. April.

Stems $\frac{1}{2}$ inch long or more, rather densely tufted, the foliage dark green. Leaves widely spreading, when dry closely imbricated, concave, ovate or elliptical, suddenly tapering into very long hair-points, margin plane; lower leaves muticous. Perichætial leaves somewhat larger, with longer points. Capsule erect, reddish-brown, perfectly smooth when dry, its walls thick. Calyptra 5-lobed at the base, covering one-third of the capsule. Lid variable in length, sometimes rostellate, sometimes conical and mammillate, not quite half as long as the capsule. Teeth of the peristome deeply bi-trifid, spreading when dry, densely barred, the bars externally prominent.

This species is very distinct from all others found in Britain. With such means for comparison as we possess, we are unable to distinguish it from *G. campestris* Hook. *Musc. Exot.*, by any permanent or tangible characters; they agree strictly in the leaves, which are of rather peculiar texture towards the base. *G. leiocarpa* Taylor, from the Swan River, Australia, appears to be only a variety with roundish capsules, longer lid, and less lurid leaves. *G. Tergestina* (Tommasini, Br. & Sch.) is also very closely allied, and appears to be only a local variety; Bruch and Schimper, however, consider it to be distinct, having the calyptra smaller, and the teeth of the peristome narrow and distantly barred.

SECT. II. *Leaves with or without diaphanous points; calyptra subdimidiate, rather oblique.* ATRATÆ.

Inflorescence dioicous.

161. 11. *Grimmia unicolor* Greville (*dingy Grimmia*); stems elongated, cæspitose, branched, fastigiate, leafless below; leaves erecto-patent, lanceolato-subulate, obtuse, rigid, margin incurved; nerve broad, reaching to the apex; capsule suberect, ovate; annulus large, dehiscent; lid rostellate. (TAB. XXXIII.)

Grimmia unicolor *Greville*, Scot. Cr. Fl. t. 123. *Hook. and Tayl.* *Wilson*, in Eng. Bot. Suppl. t. 2771. f. 2. *Bridel*, Br. Univ. *Bruch and Sch.* Monogr. p. 29. t. 23. *C. Müller*, Syn. Musc.

Hab. Alpine rocks. Abundant on the almost perpendicular faces of exposed rocks above Bach-na-gairn, at the head of Clova, Angusshire, *Mr. Drummond.* Fr. April.?

Growing in broad incoherent lurid patches. Stems 1 or 2 inches long, more or less branched; branches flexuose, brittle, fastigiate, often with slender ramuli or flagellæ bearing small, ovate, imbricated leaves, similar to those of *G. spiralis*, but more abundant. Leaves erect when dry, of thick firm texture, opaque, channelled, concave and obtuse at the apex, not at all hair-pointed, margin inflexed, so that the upper part of the leaf is semicylindrical, convex, not carinate at the back, the broad nerve predominant above, or undistinguishable from the pagina of the leaf. Perichætial leaves somewhat sheathing. Fruitstalk twice as long as the perichætium, or longer. Capsule erect or slightly oblique, yellowish-brown, smooth. Lid with a straight or inclined beak, half as long as the capsule. Teeth of the peristome densely barred, bifid, perforated, or entire. Calyptra more or less oblique and dimidiate, sometimes mitriform and lobed at the base. Inflorescence dioicous.

This species resembles the next, but has more obtuse leaves, not at all recurved in the margin.

162. 12. *Grimmia atrata* Mielich. (*black-tufted Grimmia*); stems elongated, densely cæspitose; leaves erecto-patent, rigid, somewhat crisped and incurved when dry, lanceolato-subulate, bluntish, carinate, margin reflexed; capsule suberect, elliptic-oblong; annulus large, persistent; lid rostellate; calyptra dimidiate. (TAB. XLIV.)

Grimmia atrata *Mielichhofer* in Bot. Zeit. 1819, p. 85. *Schwaegr.* Suppl. t. 116. *Hooker*, Musc. Exot. t. 100.

Nees and Hornsch. Bryol. Germ. t. 23. f. 19. *Wilson,* in Eng. Bot. Suppl. t. 2771. f. 1. *Bridel. Br. and Sch.* Monogr. p. 30. t. 24.

G. (Dryptodon) atrata *C. Müller. Dill.* Musc. t. 47. f. 30. A. B.?

Hab. Alpine rocks; rare. On Clogwyn-y-Garnedd, Snowdon, August, 1828, *W. Wilson.* Glen Callater, *Dr. Greville,* 1830. On Clogwyn dû'r Arddû, Snowdon, *Mr. Ralfs.*

Fr. Oct., April.

Dioicous. Growing in more coherent patches than the last. Stems 1 or 2 inches long, branched, fastigiate. Leaves blackish, glossy, rather less rigid than in the preceding species, of thinner texure, less obtuse, carinate, margin reflexed, nerve thinner and more distinctly defined, reaching almost or quite to the apex. Fruitstalk yellowish, somewhat thicker and longer. Capsule longer, yellowish-brown, blackish when old. Lid with a shorter beak. Calyptra dimidiate, fugacious. Teeth of the peristome bifid or perforated, densely barred, spreading or recurved when dry.

This species has been gathered by Mr. Drummond, who did not distinguish it from *Trichostomum ellipticum* of Hooker and Taylor (*Racomitrium* B. & S.), and will probably be found in some copies of his *Musci Scotici,* vol. i. No. 48. They are, indeed, much alike, but *G. atrata* is more robust, and differs considerably in the lid and calyptra.

34. RACOMITRIUM *Br. and Sch.*

RACOMITRIUM and DRYPTODON (partly) *Bridel.*

TRICHOSTOMUM *Hook. and Tayl.,* &c.

GRIMMIA (Sect. IV.) RHACOMITRIUM *C. Müller,* Syn. Musc.

Tall, handsome mosses, perennial, cæspitose, with terminal fruit. Resembling *Grimmia* in habit, with somewhat of the aspect of Hypnoid mosses, mostly tall, the ramification more or less regular. *Capsule* on a rather long, straight pedicel, erect, elliptical, subcylindrical or ovate. *Calyptra* mitriform, multifid at the base, subulate at the apex. *Lid* straight, subulate. *Leaves* spreading, lanceolate, or sometimes oblong, either with or without diaphanous points. Growing upon rocks, seldom upon soil.

Stems dichotomous (in the subgenus *Dryptodon*), or irregularly branched (in *Racomitrium* proper), innovating below the perichætium, and from the base of the stem.

Leaves in 8 rows, lanceolate or oblong-lanceolate, piliferous or obtuse, the diaphanous points denticulate, elsewhere entire, carinate, spreading, and recurved; the *nerve* externally convex, channelled on the upper side, as in *Grimmia,* vanishing below the apex; *areolæ* quadrate above, narrow, elongated, and often sinuous below.

Inflorescence dioicous. *Flowers* gemmiform and terminal; *antheridia* larger than in *Grimmia; archegonia* with shorter styles.

Fruit.—*Calyptra* reaching below the lid, conico-mitriform, with a subulate beak, the base membranous and multifid (not plicate, as in *Ptychomitrium*), the subulate beak solid, and rough with papillæ. *Capsule* erect, on a straight pedicel, elliptical or subcylindrical, smooth, narrower at the mouth. *Lid* conico-subulate, mostly straight. *Annulus* large and dehiscent. *Teeth* of the peristome 16, bi-trifid, the segments sometimes free to the base, filiform, very long in some species, in others short and subulate, unequal and irregularly cohering. *Spores* rather small. *Vaginula* cylindrical, with an ochrea at the summit.

The genus *Racomitrium* is so nearly allied to *Grimmia* through the intermediate subgenus *Dryptodon*, that it is scarcely possible to determine their exact limits. The principal marks by which *Racomitrium* can be distinguished are the less regular ramification, the tissue of the leaves composed (especially towards the base) of elongated sinuous cellules, the more solid nerve, and, above all, the subulate papillose beak of the calyptra, and the long lid with a slender, straight, subulate beak. The more slender and more deeply divided teeth of the peristome (like those of *Trichostomum*), may also be taken into account, but this applies only to *R. lanuginosum* and *canescens*, the peristome being variable in the other species.

With the exception of *Dryptodon*, where the innovations are simple, the species are more or less fasciculate, in consequence of the growth of numerous very short ramuli all along the fertile branches, the ramuli not being subsequently elongated; they, however, will not serve as a generic character, being often absent, nor are they even available to determine the species; for, in certain localities, *R. heterostichum* assumes the habit of *R. protensum*, in others that of *R. sudeticum*, and in others that of *R. fasciculare*, which in its turn has leaves somewhat resembling those of *Dryptodon.*

The generic name (ῥακος, *torn*, μιτριον) refers to the lacerated base of the calyptra.

Nine species are described in the *Bryologia Europæa.*

SECT. I. *Stems dichotomously branched; innovations simple, fastigiate* DRYPTODON.

A. Leaves obtuse, dark green.

163. 1. *Racomitrium ellipticum* Br. and Sch. (*oval-fruited Fringe-Moss*); stems rigid; leaves lanceolate-oblong, suberect when dry, margin plane and somewhat thickened, entire, their nerve strong and continued to the apex; fruitstalk short and thick; capsule roundish, hard, and smooth; lid conico-subulate. (TAB. XIX.)

R. ellipticum *Bryol. Europ.* Monogr. p. 5. t. 24.

Dryptodon ellipticus *Bridel.*
Grimmia (Dryptodon) elliptica *C. Müller*, Syn. Musc.
Dicranum ellipticum *Turner. Smith*, Eng. Bot. t. 1901. *Schwaegr.* Suppl. t. 47.
Trichostomum ellipticum *Hook. and Tayl.*

Hab. On moist alpine micaceous and schistose rocks in Scotland, Wales, and Ireland. Fr. Nov., April.

Growing in blackish tufts. Stems scarcely 1 inch long, rather rigid and fragile, decumbent at the base, where they are denuded of leaves. Leaves spreading from an erect base, erect and incurved when dry, rigid, of thick texture, smaller, narrower, and less carinate than those of *Grimmia atrata*, to which this moss is much more nearly allied than to *G. ovata;* the margin plane, scarcely reflexed, somewhat thickened. Perichætial leaves shorter than the rest, ovate-lanceolate, sheathing. Fruitstalk thick, about three times as long as the perichætium, twisting to the right when dry. Capsule roundish, erect, perfectly smooth and polished when dry, its walls thick and solid, reddish-brown. Lid as long as the capsule, the beak slender and subulate. Annulus large, subpersistent. Teeth of the peristome lanceolate, bi-trifid in the upper half, purplish, externally barred, spreading or recurved when dry. Calyptra proper to the genus, small. Inflorescence dioicous.

Smaller than *Grimmia atrata*, with a much longer lid, and the calyptra subulate above.

44. 2. *Racomitrium aciculare* Bridel (*dark-mountain Fringe-Moss*); stems elongated, loosely cæspitose, ascending; branches densely leafy; leaves spreading every way, or secund, ovate-oblong, obtuse, toothed or entire at the top, carinate, nerve ceasing below the apex; capsule erect, elliptic-oblong with a small mouth; lid subulate, straight; teeth deeply bi-trifid. (TAB. XIX.)

Racomitrium aciculare *Bridel*, Bryol. Univ. i. 219. *Br. and Sch.* Monogr. p. 6. tab. *Drypt.* 1.
Grimmia (Dryptodon) acicularis *C. Müller*, Syn. Musc.
Trichostomum aciculare *Web. and Mohr. Schwaegr. Hook. and Tayl.*
Dicranum aciculare *Hedw.* St. Cr. t. 33. *Turner. Smith*, Eng. Bot. t. 1978. *Dill.* Musc. t. 46. f. 25. and 26. B.
var. β. denticulatum ; leaves spreading every way, more distantly toothed at the apex.

Hab. On wet rocks, by rivulets, &c., in mountainous places. Fr. Nov., April.

Dioicous. Growing in dull green patches. Stems 1—3 inches long, decumbent and leafless at the base. Leaves widely lanceolate or ovate-oblong, obtuse, margin recurved, the nerve pale, not prominent at the back. Fruitstalk longer and more slender than in the preceding. Capsule oblong, pale brown, smooth, its walls thick, the mouth small. Lid almost as long as the capsule. Annulus rather broad. Teeth of the peristome cloven almost to the base, somewhat incurved when dry.

The broader very obtuse leaves, usually toothed at the apex, distinguish this from the following species, which it much resembles.

165. 3. *Racomitrium protensum* Al. Braun (*narrow-leaved mountain Fringe-Moss*); leaves spreading, or secund, lanceolato-subulate, rather obtuse; perichætial leaves somewhat sheathing; capsule elliptic-oblong, of softer texture; teeth of the peristome shorter, irregularly cloven. (Tab. XLV.)

Racomitrium protensum *Alex. Braun* in lit. *Bruch and Sch.* Monogr. p. 6. t. *Drypt.* 2.
R. aquaticum *Bridel*, Bryol. Univ. i. 222.
Grimmia (Dryptodon) aquatica *C. Müller*, Syn. Musc.
R. cataractarum *Braun. Bridel*, l. c. i. 776.
Dicranum aciculare γ. gracile *Turn.* Musc. Hib. p. 67. *Dill.* Musc. t. 46. f. 26. A.

Hab. On moist rocks by alpine rivulets; not unfrequent on the Welsh Mountains. Observed by Dillenius on the Peak of Derbyshire. Cronkley Fell, Teesdale, *John Nowell.*

Fr. April.

Dioicous. Growing in extensive light-green patches. Stems very similar to those of *R. aciculare*, but more slender, less rigid, and leafy to the base. Leaves longer, narrower, more rigid, entire, erecto-patent, usually turned to one side, margin reflexed, the nerve stronger, more prominent at the back, reddish-brown. Capsule subcylindrical, pale brown, its walls thinner and softer. Fruitstalk pale, about ½ inch long. Calyptra 5-lobed at the base or multifid. Lid conico-subulate, equalling the capsule in length, sometimes much shorter. Teeth shorter than in the preceding, cloven to the base, incurved when dry.

This species varies in the length of the fruitstalk, in the more or less obtuse apices of the leaves, and in the length of the peristome. It has narrower and more strongly nerved leaves than the preceding, from which it is more easily distinguished than from *R. heterostichum var.* γ., compared with which the leaves are larger, never diaphanous at the summit, the cellules less elongated and sinuous, peristome longer, and the capsule with a wider mouth.

B. Leaves with diaphanous points.

166. 4. *Racomitrium sudeticum* Br. and Sch. (*slender mountain Fringe-Moss*); stems slender, elongated, dichotomously branched and somewhat fasciculate; leaves spreading from an erect base, recurved or incurved, lanceolate-tapering, with diaphanous denticulate points, carinate; fruitstalk short; capsule small, ovate-oblong; lid with a short beak. (Tab. XIX.)

Racomitrium sudeticum *Br. and Sch.* Monogr. p. 7. t. (*Racom.*) 1.
Dryptodon sudeticus *Bridel*, Bryol. Univ. i. 195.
Trichostomum sudeticum *Funck.*
T. microcarpon *Hedw.* Sp. M. t. 23. f. 18—12. *Turner. Smith*, Eng. Bot. t. 1440. *Hook. and Tayl.*
T. patens var. *Schwaegr.* Suppl. t. 37. (fid. Bruch and Schimper).

Racomitrium microcarpon *Bridel*, Br. Univ. i. 211. (omitting the synonym of Funck).
Grimmia (Dryptodon) microcarpa *C. Müller*, Syn. Musc. *Dill.* Musc. t. 47. f. 29. A. B. C.

Hab. On exposed alpine rocks. Fr. April.

Dioicous. Growing in loose grayish or lurid patches. Stems slender, decumbent and leafless at the base, dichotomously branched, with short ramuli. Leaves spreading, slightly recurved, erect and somewhat incurved when dry, scarcely crisped, not crowded, the upper ones white-tipped, margin reflexed, upper areolæ sinuoso-quadrate. Fruitstalk 2—3 lines in length, slender, often slightly curved. Capsule small, oval, or elliptical-oblong, not cylindrical, pale brown. Lid shorter than the capsule, acutely conical. Annulus dehiscent. Teeth narrow-lanceolate, confluent at the base, bi-trifid, somewhat incurved when dry.

We are not able to determine *Trichostomum obtusum* Smith, *Fl. Brit.* 1244., Dill. *Musc.* t. 47. f. 30., which, indeed, as Bridel justly remarks (*Bryol. Univ.* i. 193.), very little accords with *Trichostomum patens*, although the specimen in the *Dillenian Herbarium* has been repeatedly pronounced to be that moss by competent observers. Possibly Dillenius may have had in view *Racomitrium heterostichum var. γ. gracile* of Bruch and Schimper, which has muticous leaves, and small oblong capsules, scarcely larger than those of *R. sudeticum.* According to a remark of Sir J. E. Smith, in *Eng. Bot.* t. 1901, Dillenius has confounded *R. sudeticum* with *R. ellipticum*, but no evidence of this is observable in the figures above cited.

SECT. II. *Stems irregularly branched; branches with lateral ramuli; innovations not fastigiate.* RACOMITRIUM.

A. Leaves without diaphanous points.

67. 5. *Racomitrium fasciculare* Bridel (*green mountain Fringe-Moss*); stems elongated, dichotomously branched; branches with fasciculate short ramuli; leaves crowded, spreading, recurved or incurved, lanceolate, tapering, muticous, carinate, margin reflexed, areolæ elongated and sinuous; capsule elliptical; lid subulate; calyptra very papillose; teeth of the peristome long, slender, nodulose, bipartite; annulus large. (TAB. XIX.)

R. fasciculare *Bryol. Univ.* i. 218. *Bruch and Sch.* Monogr. p. 8. t. 4.
Grimmia (R.) fascicularis *C. Müller*, Syn. Musc.
Trichostomum fasciculare *Schrad. Schwaegr.* Suppl. t. 38. *Turner. Smith*, Eng. Bot. t. 2005. (fig. not good). *Hook. and Tayl. Web. and Mohr. Dill.* Musc. t. 47. f. 28.; and t. 46. f. 26. C.

Hab. On rocks. Fr. March.

Growing in loose irregular patches of a light-green colour. Stems 1—2 inches long, decumbent, the innovations erect and somewhat fastigiate, bearing numerous short fasciculate ramuli. Leaves spreading from an erect base, variously curved, slightly crisped and erect when dry, narrow, lanceolate, tapering to a rather acute point, which is never white-tipped; all the areolæ very long, narrow, and sinuous; nerve very thin, scarcely prominent at the back; margin recurved. Perichætial leaves broader and of thinner texture. Capsule erect, narrowly elliptical, not oblong, brown, blackish when old, its walls thick, smooth when dry. Calyptra more copiously papillose all over than in the other species, usually falling with the lid, which is nearly as long as the capsule. Annulus large and dehiscent. Peristome red, teeth very slender, divided to the base, erect when dry.

The muticous leaves and thick capsule distinguish this from *R. microcarpon;* it is sometimes confounded with varieties of *R. heterostichum*, from which it differs in the elliptical capsule, long slender teeth, and narrow sinuous areolation of the leaves.

B. Leaves with diaphanous points.

168. 6. *Racomitrium heterostichum* Bridel (*bristly mountain Fringe-Moss*); stems elongated, branches somewhat fasciculate; leaves erecto-patent, or subsecund, lanceolate, subplicate, tapering into diaphanous points, margin recurved; capsule subcylindrical, small-mouthed; calyptra papillose at the apex; lid shorter than the capsule, slightly oblique; teeth of the peristome short, irregularly cloven, slightly incurved when dry. (Tab. XIX.)

R. heterostichum *Bryol. Univ.* i. 214. *Br. and Sch.* Monogr. p. 9. t. 2, 3.

Grimmia (R.) fascicularis *C. Müller*, Syn. Musc.

Trichostomum heterostichum *Hedw.* St. Cr. 2. t. 25. *Schwaegr. Turner. Smith*, Eng. Bot. t. 1347. *Hook. and Tayl.*

Bryum heterostichum *Dicks. Dill.* Musc. t. 47. f. 27. A. F. G.

var. β. alopecurum; stems slender, elongated, branches fasciculate; leaves with short hair-points; capsule smaller.

Racomitrium alopecurum *Bridel*, Br. Univ. i. 215.

Trichostomum affine *Schleich.*

Trichostomum saxatile *Taylor* in lit. (T. fasciculare var. *Tayl.* in Flora Hib. pt. 2. p. 20.).

var. γ. gracilescens; stems sparingly branched; leaves obtuse; capsule small, on a shorter pedicel.

Dicranum aciculare var. δ. pumilum *Turn.* Musc. Hib. p. 67.?

Hab. On rocks and walls; β. and γ. almost as frequent as the typical form in Ireland, Wales, and in several parts of England. Fr. March.

Growing in roundish hoary patches. Stems ½—1½ inch long, decumbent at the base, sparingly branched, the branches often fasciculate, but less so than in *R. fasciculare.* Leaves crowded, spreading every way, or sometimes secund, erect when dry, lanceolate, tapering into a rather long silvery denticulate point, elsewhere (in the typical form) of a somewhat lurid green colour, carinate, margin recurved, areolæ in the upper part of the leaf subquadrate, elongated and sinuous below. Capsule subcylindrical, often somewhat clavate or widened above, brown, the mouth more contracted than in other species, its walls thick, smooth when dry. Calyptra papillose at the apex only, less dilated below than in the preceding species. Lid seldom above half the length of the capsule. Annulus reddish brown. Teeth of the peristome short, as in *R. sudeticum*, bifid, the divisions unequal and irregular, incurved when dry.

Except as to the var. γ., which is a miniature resemblance of *R. protensum*, this species may always be distinguished from *R. fasciculare* by its more or less white-tipped leaves, and by the subcylindrical narrow-mouthed capsule; additional characters are also found in the different areolation of the leaf, and in the small peristome. Var. γ. differs from *R. protensum* in the smaller size of the plant, the short branches, less rigid leaves, pale and less defined nerve, and in the smaller peristome.

The variety β., with a more slender habit and obscurely white-tipped less lurid leaves, is more apt to be mistaken for *R. fasciculare* than the typical form. It appears to grow in more moist and shady situations, and sometimes (as near Killarney, on the old road to Kenmare) grows in company with the var. γ., which, according to Bruch & Schimper, has the leaves occasionally white-tipped, and probably owes its characters, such as they are, to the more humid locality in which it vegetates.

69. 7. *Racomitrium microcarpon* Bridel (*small-fruited mountain Fringe-Moss*); stems slender, fasciculate, with numerous short branches; leaves spreading, recurved or falcato-secund, lanceolate-tapering, with short diaphanous points, carinate; fruit-stalk short; capsule small, oblong; teeth of the peristome short. (Tab. LXI.)

R. microcarpon *Bridel*, Br. Univ. i. 211. (partly). Bryol. Europ.

Grimmia (Dryptodon) microcarpa *C. Müller*. Syn. Musc.

Hab. Highlands (according to a specimen so marked in *Herb. Hooker.*)

About the size of *R. sudeticum*, with which Müller (*Synops. Musc.*) persists in uniting it, but of quite different aspect, owing to the short branches, and in habit approaching to *R. canescens*. Leaves yellowish, wider than in *sudeticum*, and of different texture, having the areolæ everywhere elongated and sinuous, the diaphanous points more evident, capsule more oblong, resembling that of *R. heterostichum*, but much smaller, of thinner texture, and paler.

The reason for transferring the name from *R. sudeticum*, which is certainly Hedwig's *R. microcarpon*, is not apparent. Dr. Taylor's *var. β. oblongum* (Fl. Hib.) may belong to this species.

70. 8. *Racomitrium lanuginosum* Bridel (*woolly Fringe-Moss*); stems much elongated, slender, with fasciculate branches; leaves moderately spreading, lanceolate, tapering into long diaphanous

eroso-dentate points; capsule small, ovate, on a rough short pedicel; teeth of the peristome long, slender, bipartite. (Tab. XIX.)

R. lanuginosum *Bryol. Univ.* i. 215. *Bruch and Schimp.* Monogr. p. 11. t. 6.
Grimmia (R.) lanuginosa *C. Müller,* Syn. Musc.
Trichostomum lanuginosum *Hedw.* St. Cr. 3. t. 2. *Swartz. Turner. Smith,* Eng. Bot. t. 1348. *Web. and Mohr. Hook. and Tayl.*
Bryum hypnoides *a. Linn. Dill.* Musc. t. 47. f. 32.

Hab. On mountains, especially at a considerable elevation; on walls and rocks; also on barren gravelly heaths. Fr. March.

Growing in extensive hoary patches. Stems often a foot long, slender, fragile, flexuose, forked or subdivided, with numerous short fasciculate ramuli, sometimes irregularly pinnate. Leaves crowded, spreading from an erect base, sometimes secund, flexuose and often recurved when dry, especially at the top of the stem, tapering into a curiously and elegantly toothed diaphanous point of greater or less length, carinate, margin recurved, areolæ narrow and sinuous. Fruitstalk 2—4 lines long, roughish, especially when young. Capsule small, ovate, small mouthed, pale brown, smooth when dry, its walls thick. Calyptra papillose at the apex. Lid as long as the capsule, or longer. Annulus large, dehiscent. Teeth of the peristome nearly as long as the capsule, very slender, bipartite, nodulose, straight and erect when dry. Spores very small.

Owing to the irregular growth of innovations the fruit usually appears to be lateral, and from the shortness of the fruitstalks is not easily found. It can scarcely be mistaken for any other species.

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9. *Racomitrium canescens* Bridel (*hoary Fringe-Moss*); stems elongated, branches more or less fasciculate; leaves spreading and recurved, ovate-lanceolate, tapering into rough eroso-denticulate diaphanous points; capsule on a long fruitstalk, ovate, somewhat striated when dry; lid long, subulate; teeth of the peristome very long, slender, nodulose, bipartite. (Tab. XIX.)

R. canescens *Brid.* Br. Univ. i. 208. *Br. and Sch.* Monogr. p. 12. t. 7, 8.
Grimmia (R.) canescens *C. Müller,* Syn. Musc.
Trichostomum canescens *Hedw.* St. Cr. 3. t. 3. *Turner. Smith,* Eng. Bot. t. 2534. *Schwaegr. Hook. and Tayl. Dill.* Musc. t. 47. f. 27. B. C. D. E.

var. β. prolixum; with fasciculate ramuli on the older innovations only; the younger ones simple.

var. γ. ericoides; whole plant beset with fasciculate ramuli; leaves squarrose, recurved.

Racomitrium ericoides *Bridel,* Bryol. Univ. i. 210.
Trichostomum ericoides *Schwaegr.* Suppl. t. 38. *Schrader, Turner. Smith,* Eng. Bot. t. 1991. *Wahlenb.* Fl. Lap.
Bryum ericoides *Dicks. Dill.* Musc. t. 47. f. 31.

Hab. Sandy heaths and stony places, seldom upon rocks. Var. γ. in drier more exposed places, on sandy soil. Fr. March.

Growing in loose extensive yellowish-green or hoary patches. Stems 2—4 inches long, decumbent at the base; the young shoots erect. Leaves widely spreading and recurved from an erect base, sometimes inflexed towards the top, occasionally subsecund, crisped, flexuose or occasionally recurved when dry; the long white points sharply denticulate and rough with papillæ, those of the ramuli narrower than the rest, all somewhat plicate below; margin recurved, roughish or papillose on both sides; areolæ as in the preceding species. Fruitstalk about an inch long, reddish, twisting to the left when dry. Capsule ovate, tapering towards the mouth and somewhat conical, brown, with 8 obscure striæ or furrows when dry. Calyptra slightly papillose at the apex. Lid very long and slender, often longer than the capsule. Teeth of the peristome as long as the capsule, slender, bipartite, nodulose, often cohering at the apex, erect when dry.

The different varieties, with more or less numerous ramuli, are entirely dependent on local conditions for their several characters, and cannot be legitimately separated as species.

SUBORDER XIII. PTYCHOMITRIEÆ.

Plants growing in dense tufts on rocks, bearing fruit at the extremity; perennial.

Stems dichotomously branched. *Leaves* crowded, linear-lanceolate or lanceolate, nerved, mostly crisped or incurved when dry, of firm texture; the *areolæ* dot-like.

Capsule erect, symmetrical, roundish or elliptic-oblong, of firm texture, without any tapering swollen base, mostly furnished with an annulus. *Lid* with a straight beak, conical at the base. *Peristome* simple; the *teeth* 16, simple or bifid, rarely cribrose, mostly trabeculated externally. *Calyptra* large, mitriform-subulate, with 10 or more furrows, at length ventricose below, and either divided at the base into short segments or embracing the seta below the capsule. *Vaginula* without a *tubus vaginalis* or ochrea. *Spores* usually small. *Inflorescence* monoicous or dioicous. *Barren flowers* gemmiform, mostly terminal. *Fertile flowers* mostly without a proper perichætium; *paraphyses* filiform.

The species of this order are intermediate between the *Grimmieæ* and the *Orthotricheæ.* From the latter (with which they are united in *Bryologia Europæa*) they differ in the texture of the leaves, especially in the absence of papillæ; in the narrow subulate apex of the calyptra, which is never truly campanulate; in the absence of hairs and of the *tubus vaginalis;* and, above all, in the absence of the tapering apophysis. The peristome, also, is of quite different structure, its primary divisions never more than 16, and the sporangium fills the whole cavity of the capsule, to which it is closely applied. Except in the furrowed calyptra, there is, indeed, much more affinity with the *Grimmieæ.* We include in the order *Ptychomitrieæ* three European genera, one of which, with the teeth beautifully cribrose (*Coscinodon* Sprengel) is not found in Britain.

35. GLYPHOMITRIUM *Schwaegr.*

ENCALYPTA *Smith.*
GRIFFITHIA *R. Brown.*

Plants dwarfish, tufted, with terminal fruit, perennial, growing in crevices of rocks. *Stems* sparingly branched, densely leafy. *Leaves* opaque, linear-lanceolate, incurved and crisped when dry; *perichætial leaves* larger, sheathing. *Capsule* exserted, erect, roundish. *Annulus* small. *Calyptra* large, ventricose, plicate, contracted at the base, entirely covering the capsule, at length laciniated below. *Peristome* single; *teeth* 16, in pairs, inserted below the orifice of the capsule, widely lanceolate, with numerous transverse externally prominent bars, hygroscopic, strongly reflexed when dry. *Spores* large, smooth, globular. *Inflorescence* monoicous: *barren flower* axillary, gemmiform; *fertile flower* terminal, elongated; *antheridia* and *archegonia* few, with filiform paraphyses.

Allied to *Grimmia;* distinguished by the large plicate calyptra, and by the paired teeth, which are strongly reflexed when dry, analogous to those of *Orthotrichum,* but of different texture. Name from γλυφω, *I carve,* and μιτριον, *calyptra.*

172. *Glyphomitrium Daviesii* Schwaegr. (*Mr. Davies' Veil-Moss*). (TAB. XIII.)

G. Daviesii *Schwaegr.* Suppl. ii. p. 41. t. 113. *Bridel, Hook. and Tayl. Bruch and Schimper,* Monogr. p. 3. t. 1.
Grimmia Daviesii *Turner. Hook. and Greville,* in Edin. Journ. Sc. i. 131.
Encalypta Daviesii *Smith,* Eng. Bot. t. 1281.
Griffithia Daviesii *Brown,* in Lin. Tr. vol. xii. p. 575.

Hab. On rocks, chiefly near the sea. Basaltic rocks in Ireland (Giant's Causeway, &c.). Near Kilpatrick, Scotland, *Dr. J. D. Hooker.* Pass of Llanberis, and in other places about Snowdon, N. Wales. Fr. June, July.

Growing in dense, dark-green tufts, usually in the crevices of detached rocks. Stems about $\frac{1}{2}$ inch long, subdivided. Leaves spreading, crisped and incurved when dry, narrow, linear-lanceolate, acute, keeled, entire, margin slightly thickened, plane or somewhat reflexed below; nerve strong, continued to the apex; areolæ dot-like, rather larger at the base. Perichætial leaves larger than the rest, sheathing, their points recurved. Fruitstalk short, twice as long as the perichætium, or longer, straight or curved, slightly thickened at the top. Capsule erect, roundish, wide-mouthed when dry, pale yellowish-brown, smooth and firm, the mouth reddish. Lid rostrate, nearly as long as the capsule. Annulus indistinct. Teeth of the peristome broad, plane, approximated in pairs, red, with a diaphanous border, externally trabeculated, strongly recurved when dry, converging when moist. Spores large, green. Calyptra ventricose, completely covering the capsule, and at the base closely embracing the seta, at length torn, chiefly on one side, pale yellowish-brown, plicated.

This moss bears some resemblance to small states of *Ptychomitrium polyphyllum*, and owing to its diminutive size is liable to escape observation.

36. PTYCHOMITRIUM *Br. and Sch.*

TRICHOSTOMUM *Schwaegr. Hook. and Taylor.*
DICRANUM *Smith.*
RACOMITRIUM *Bridel.*
BRACHYSTELEUM *Rchb. C. Müller.*

Plants tufted, perennial, growing on exposed rocks, or on the ground, never upon trees, nor in marshes. *Stems* dichotomously branched; *branches* fastigiate. *Leaves* in 8 rows (disp. $\frac{3}{8}$), linear-lanceolate, nerved, concave, crisped when dry; *areolæ* dot-like.

Capsule terminal, erect, regular, tapering at the base. *Annulus* large. *Lid* conico-rostrate. *Calyptra* mitriform, deeply furrowed, subulate above, divided into several laciniæ at the base. *Peristome* single; *teeth* 16, deeply bifid, the divisions slender, almost filiform, not hygroscopic. *Spores* small.

Inflorescence monoicous. *Barren fl.* axillary or terminating a branch, gemmiform; *antheridia* elongated. *Fertile fl.* small, with short paraphyses. No distinct perichætium.

Allied to *Grimmia* and to *Racomitrium*, but distinguished from both by the plicate calyptra, which is smaller in proportion than that of *Glyphomitrium*, from which it differs essentially in the structure of the peristome. Two species are described in the *Bryologia Europæa*. Name from πτυχη, *a plait*, and *μιτριον*, *calyptra*.

13. *Ptychomitrium polyphyllum* Br. and Sch. (*many-leaved Fringe-Moss*); stems branched, tufted; leaves crowded, spreading, crisped when dry, linear-lanceolate, widened below, serrated at the apex, acute; capsule elliptical. (TAB. XIX.)

Ptychomitrium polyphyllum *Br. and Sch.* Monogr. p. 4. t. 1.
Trichostomum polyphyllum *Schwaegr.* Suppl. t. 39. *Turner*, Musc. Hib. p. 35. t. 7. *Smith. Hook. and Taylor*, tab. xix.
Dicranum polyphyllum *Eng. Bot.* t. 1217.
Trichostomum cirratum *Smith*, Fl. Brit. p. 1239.

Bryum polyphyllum *Dicks.* *Dill.* Musc. t. 48. f. 41.
Racomitrium polyphyllum *and* falcifolium *Bridel.*
Brachysteleum polyphyllum *Reichenbach.* *C. Müller*, Syn. Musc.

Hab. Rocks in mountainous places; occasionally upon walls throughout Britain. Fr. March, April.

Growing in dense incoherent tufts. Stems 1—2 inches long, branched upwards. Leaves keeled, nerved to the apex, and there coarsely toothed, dark green; areolæ dot-like or guttulate, almost as in *Orthotrichum.* Perichætial leaves scarcely different from the rest. Capsule pale brown, narrowly elliptical, on a long seta, the upper part of which is twisted to the left: not unfrequently two or more capsules arise from the same perichætium. Teeth of the peristome long and slender, pale red, papillose, not articulated, erect. Barren flower gemmiform, pedicellate, two or more together, in close contact with the archegonia, and enclosed by the perichætial leaves, so as to constitute a kind of synoicous flower: when they seem to be axillary (v. *Bryol. Europ.*) there are always abortive archegonia found with them.

Ptychomitrium pusillum Br. and Sch., not found in Britain, is a smaller species with entire obtuse leaves, the nerve vanishing below the apex.

The genus *Notarisia* of Hampe (the type of which is *Encalypta crispata* Hedw., *Grimmia crispata* Hook. *Miscel. Bot.* t. 36.) does not differ from *Ptychomitrium*, except in having the teeth entire, and merely marked with a medial line, not bifid.

SUBORDER XIV. ORTHOTRICHEÆ.

37. ORTHOTRICHUM. *Bristle-Moss.*

Capsule immersed in the leaves, or more or less exserted, erect, pear-shaped, oblong pyriform, or cylindrical, *apophysate;* the *apophysis* hollow, more or less elongated, sometimes furnished with cuticular stomata, tapering into the pedicel; the capsule longitudinally marked with 8 (or rarely 16) coloured striæ (one British and a very few exotic species excepted) alternating with the teeth of the peristome, and in the dry state forming prominent ridges. *Sporangium* loosely attached by short fibres to the sides of the capsule, consisting of a thick, succulent, rather opaque membrane. *Peristome* either single or double, absent in one species; *outer peristome* inserted below the mouth of the capsule, consisting really of 32 equal divisions, but these are so connected as to seem only 8 teeth, or in a few cases 16, which are broad and flat, and composed of quadrangular cells. In a dry state the teeth are either erect, spreading, or strongly reflexed. *Inner peristome* composed of 8 or 16 equal cilia, or of 16 alternately shorter ones, either coloured or pellucid, alternating in position with the outer teeth, and arising from the sporangium. *Lid* short, conical-rostellate.

Annulus none. *Calyptra* large, campanulate, longitudinally plaited, with about 8 furrows, the base somewhat torn into short segments. In most of the species the calyptra is covered with straight hair-like processes (hence the generic name).

Plants perennial, growing in round tufts, fertile at the summit, on trees and stones, never upon soil. *Stem* erect or procumbent, very seldom creeping, branched with innovations. *Leaves* in many rows, concave, keeled, nerved, the margin recurved or revolute, spreading from an erect base, lanceolate; upper leaves crowded into a small tuft; lower ones more distant, when dry twisted or curled, seldom straight; *areolæ* in the upper part of the leaf composed of small roundish dot-like cellules arranged in rows, each cellule bearing two more or less prominent papillæ on each side of the leaf; in the lower part of the leaf, especially towards the margin, the areolæ are larger, colourless, hexagonal or rectangular. *Inflorescence* usually monoicous, sometimes dioicous. The *flowers* bud-like; *antheridia* oblong-oval, with distinct jointed pedicels formed of two rows of cellules; *archegonia* (called *pistilla* by most authors) few together, destitute of a proper sheathing perichætium.

In consequence of the growth of innovations, the stems become dichotomously branched, and hence arises the cushion-like aspect of the various species when growing. The *foliage* is remarkably susceptible of moisture; when dry either erect and imbricated, or crisped and variously contorted, but immediately after contact with water more or less spreading. The *barren flower* in the monoicous species is either terminal or axillary, at first in close proximity to the fertile flower, becoming distant by the subsequent growth of the plant as the fruit ripens. In the dioicous species the barren-flowered plant is more slender than the fertile, with the leaves more uniform, and the barren flower is at first terminal. The *antheridia* vary in number from 5 to 20, and are usually accompanied by paraphyses of great length. The *archegonia* are from 5 to 10, and are enclosed in narrower and longer buds than the barren flower, composed of about 9 lanceolate leaves, which increase in size as the fruit is developed until they surpass the stem-leaves in size, differing from them in having longitudinal furrows at the base. The *fruit* ripens in twelve months after the first appearance of the flower from which it originates. At a very early stage the young calyptra, previous to its separation from the vaginula, of which it is the continuation, is marked with furrows, but the hairs on the surface are not developed until a later period; they resemble the paraphyses, but have a different organisation. In separating from the vaginula, the calyptra leaves behind a membranous tube (*tubus vaginalis*, or *ochrea*), which surrounds the lower part of the fruitstalk, and is visible in most of the species (frequently wanting in *O. Ludwigii* and its allies with crisped leaves and exserted capsules). The *vaginula* is compact, and in many species is covered with hairs similar to those of the calyptra. The *striæ* of the capsule consist of larger cellules than the other parts, and are more deeply coloured; when more than 8, the intermediate striæ are shorter and unequal. The fruit ripens in the spring and summer months, each species at its own particular season. The European species described in the *Bryologia Europæa* are 34 in number; of these, it is stated that they present but few variations, and that their specific characters are constant and "*bien tranchées;*" but on this subject diversity of opinion may exist. In the presence of an apophysis, and in the structure of the teeth of the peristome, this genus approaches to the *Splachneæ.*

This genus (named from ορθος, *straight*, and ϑριξ, *hair*) affords a striking example of the futility of any generic character derived solely from the peristome; for the species have single or double peristomes, and one is altogether destitute of that organ; yet in all other respects they are so uniform in structure that they cannot be separated. Two extra European genera, *Macromitrium* and *Schlotheimia*, belonging to this family, are almost equally variable in the peristome.

A. Capsule immersed, or but slightly exserted; calyptra with about 10 furrows; ochrea distinct.

a. Capsule with 16 furrows; teeth of the peristome 16, free, equidistant.

174. 1. *Orthotrichum cupulatum* Hoffm. (*single-fringed sessile Bristle-Moss*); stem branched; leaves spreading, lanceolate, keeled; capsule obovate, with 16 furrows; calyptra campanulate, more or less hairy. (Tab. XXI.)

O. cupulatum *Hoffm.* Germ. v. 2. p. 26. *Web. and M.* Tasch. p. 230., Musc. Brit. p. 125. t. 21. *Schwaegr.* Suppl. i. 2. p. 35. t. 55. *Brid.* Br. Un. i. 272. *Hook. and Grev.* in Edin. Journ. Sc. i. p. 112. *Bruch and Sch.* Monogr. p. 8. t. 2.
O. anomalum *Smith*, Fl. Brit. p. 1267., Eng. Bot. t. 1423.
O. strangulatum *P. Beauv.* *Schwaegr.* Suppl. t. 54.
O. urceolatum *Schleicher.*
O. confertum *Bruch.* olim.

Hab. Rocks and walls, chiefly on limestone. Fr. April, May.

Stems 1 inch long. Leaves when dry loosely imbricated, the nerve distinct, lower leaves brownish; perichætial leaves erect. Vaginula smaller and shorter than in the next species. Capsule on a short pedicel, immersed in the leaves, obovate, of thick texture, pale brown, with 16 orange-brown striæ, which when dry are prominent ridges; the capsule when dry is wide-mouthed and urceolate. Lid with a short beak and reddish margin. Calyptra wider and paler than in the next. Teeth of the peristome almost equidistant, when dry spreading, with a short external laminar appendage which seems to represent a portion of an annulus. Occasionally, rudiments of an internal peristome are visible.

This species varies as follows:—
var. β.; capsule exserted.
  O. Rudolphianum *Lehm.*
  O. Floerkii *Hornsch.*
  O. commutatum *Bruch*, in *Brid.* Bryol. Un. i. 783.
var. γ.; capsule exserted; calyptra naked.
  Orthotrichum nudum *Dickson*, Crypt. iv. p. 7. t. 10. f. 13. *Smith*, Fl. Brit.; Eng. Bot. t. 1325. *Turner*, Musc. Hib.

This variety is easily distinguished from *O. anomalum* by the peristome, and by the more numerous striæ of the capsule. Dickson's specimen, in *Herb. Turner*, is smaller than his figure, and has the leaves more flaccid and less recurved in the margin than those of the typical form. The *Eng. Bot.* specimen is right, but a specimen in *Herb. Turner*, from Mr. Sowerby to Rev. Mr. Dalton, named *O. nudum*, is certainly *O. Sprucii.*

O. urnigerum of Myrin, not found in Britain, differs in having an inner peristome of 16 regularly formed cilia, and a hairy vaginula. *O. Sturmii* is known by the obscurely 8-striate capsule.

b. Capsule with 8 furrows.

2. *Orthotrichum anomalum* Hedw. (*anomalous Bristle-Moss*); stem sparingly branched, erect; leaves spreading, lanceolate, keeled along the nerve; capsule on a longer pedicel, exserted, oblong, with 8 striæ; peristome simple; calyptra campanulate, hairy. (TAB. XXI.)
  O. anomalum *Hedw.* St. Crypt. t. 37.; Sp. M. p. 162. *Web. and M.* Tasch. p. 229. *Turn.* Musc. Hib. p. 94.; Musc. Brit. p. 126. t. 21. *Schwaegr.* Suppl. i. 2. p. 37. *Dicks.* Crypt. Fasc. 4. p. 6. *Hook. and Grev.* in Edin. J. Sc. v. 1. p. 119.; Eng. Bot. Suppl. t. 2696. *Bruch and Sch.* Monogr. p. 10. t. 3.
  O. aureum *Mart.*
  O. saxatile *Bridel.*
  Bryum striatum β. *Linn.* *Dill.* Musc. t. 55. f. 9. (fide *Hook. and Arnott*).

Hab. On rocks and walls, chiefly of limestone. Fr. Spring.

Stems about 1 inch long. Leaves rather less spreading than in the last, the nerve stronger, and the margin more strongly revolute, when dry tawny brown. Vaginula oblong, naked or hairy. Capsule exserted, subcylindrical, reddish-brown, with 8 orange striæ or ribs, when dry contracted towards the mouth. Calyptra reddish-brown, hairy, especially on the ridges. Teeth of the peristome 16, in pairs, appearing at first as if only 8 in number, pale buff, erect when dry, and sometimes accompanied with rudiments of an inner peristome. Barren flowers terminal, at first; but when the fruit is formed they are in appearance axillary, or at the base of the ramuli.

Varieties—

var. β.; stem with fasciculate branches; leaves narrow, patent-recurved, yellowish; capsule narrower, cylindrical.

var. γ.; stem and branches longer; leaves broad, lanceolate; pedicel longer.

This species is easily known from *O. cupulatum* by its red, oblong, exserted capsule, which we have never seen with more than 8 ribs, though it is said in *Bryol. Europ.* to have 16 striæ. The whole plant has usually a reddish tint. The spores are smaller than in *O. cupulatum*. *O. anomalum* of Dickson, in *Herb. Turner*, is only a small state of *O. affine.*

176. 3. *Orthotrichum pumilum* Dickson, Smith (*dwarf Bristle-Moss*); stems dwarfish, tufted, dichotomously branched; leaves crowded, spreading, imbricated and erect when dry, lanceolate or elliptic-lanceolate, rather obtuse; capsule sessile, with an abrupt apophysis, widely striated; calyptra campanulate, naked. (Tab. XLV.)

O. pumilum *Dickson,* Crypt. Fasc. 4. p. 5. *Smith,* Fl. Brit. 1264.; Eng. Bot. t. 2168. *Turner,* Musc. Hib. 98. *Schwaegr.* Suppl. t. 50. *Bridel. Web. and Mohr. Br. and Schimper,* Monogr. p. 14. t. 5. (not of *Swartz,* according to *Br. and Sch.*)

O. affine β. pumilum *Hook. and Tayl.* (partly).

O. semicompletum *Brunton MSS.* in Herb. Turner.

Hab. On trees, rare. Near Kilcock, Ireland, *Mr. R. Brown.* Copgrove, Yorkshire, *Rev. J. Dalton.* Near Ripon, *Mr. W. Brunton.* Near York. *Mr. Spruce.* Fr. April.

One of our smallest species, growing in small dense tufts. Leaves spreading, sometimes recurved, of softer texture than those of *O. affine* and the allied species, with larger areolæ, not papillose, the margins strongly revolute. Vaginula naked, short. Capsule with scarcely any pedicel, except such as is immersed in the vaginula, but with a distinct bladdery apophysis, not tapering below so gradually as in the other species, and when dry abrupt and rounded at the base, elliptic-oblong or almost oval, yellowish, with 8 broad reddish ribs or striæ, when dry contracted below the mouth. Calyptra pale, or straw-coloured, reddish at the apex. Outer peristome buff-coloured; inner cilia 8, short, pale yellow, incurved. Lid short. Spores small, brown.

According to Bruch and Schimper, this species varies with more slender stems, leaves shorter, recurved, acuminated, and calyptra hairy. *O. fallax* of Br. and Schimp., which is *O. pumilum* of Swartz, has the capsule more oblong, exserted, somewhat pedicellated, with paler striæ of a yellow colour; teeth of the peristome larger, cilia longer and diaphanous; perichætial leaves longer, more erect and acuminated.

O. semicompletum of Brunton is said to have 16 cilia, but we do not find more than 8 in the specimen sent by him to Mr. Turner.

177. 4. *Orthotrichum tenellum* Bruch (*slender-fruited Bristle-Moss*); stems short, tufted, sparingly branched; leaves spread-

ing, loosely imbricated when dry, lanceolate-oblong, rather obtuse; capsule exserted, oblong, widely striated; calyptra conical-campanulate, slightly hairy. (TAB. XLV.)

O. tenellum *Bruch,* in *Brid.* Bryol. Univ. *Bruch and Schimp.* Br. Europ. p. 15. t. 6.

Hab. On trees. Near York, *Mr. Spruce.* Sussex, *Mr. Mitten.* Near Bantry, *Miss Hutchins,* in *Herb. Turner.* Near Gresford, N. Wales. Fr. May, June.

Leaves narrower than in the last species, almost ligulate, pale green, the areolæ somewhat smaller. Capsule darker coloured, pedicellated, yellowish brown, with 8 broad orange-coloured ribs, subcylindrical, of thick stout texture, not contracted below the mouth when dry; apophysis less bladdery; the ochrea more evident. Lid short, with a broad red border, gradually passing into the yellow of the upper part. Calyptra yellow, glossy, reddish-brown at the apex, sprinkled with a few short hairs. Peristome yellow, rather small, outer of 8 teeth; inner cilia 8, of the same length. Spores as in *O. pumilum.*

This is one of the most beautiful species, easily recognised by its narrow, elongated, golden-brown capsules, which are strongly ribbed when dry, and by the narrow, glossy, yellow calyptra. It is distinct from *O. affine*, in the thick texture and different form of the capsule, and in the narrow leaves. *O. leucomitrium* Br. and Sch., is similar in some respects, but differs in the thicker capsule with narrower striæ, more convex lid, larger peristome with 16 cilia, and in the whitish, almost naked calyptra.

8. 5. *Orthotrichum pallens* Bruch (*pale-fruited Bristle-Moss*); stems short, somewhat tufted, sparingly branched; leaves spreading, imbricated when dry, lanceolate-oblong, rather obtuse; capsule elliptic-oblong, widely striated; calyptra conic-campanulate, naked, pale. (TAB. XLV.)

O. pallens *Bruch,* in Bryol. Univ. *Bruch and Sch.* Bryol. Europ. p. 24. t. 13.

Hab. On trees, rare. Near York, *Mr. Spruce.* Fr. June.

Plants either fascicled or sometimes solitary. Stem simple or forked, erect. Leaves widely spreading, when wet, and of soft texture, erect when dry, the upper ones especially somewhat ligulate and obtuse, pale green, the margins revolute, those of the perichætium erect and still more obtuse, almost as long as the capsule. Vaginula naked. Capsule elliptic-oblong, with a large bladdery apophysis and very short pedicel, when dry almost cylindrical, very pale brown, with 8 rather broad striæ of a deeper colour, when dry very slightly contracted below the mouth. Lid short, with a small very short beak, and reddish border. Peristome with 8 yellowish teeth, reflexed when dry, and 16 cilia, of which the alternate ones are usually shorter than the others. Calyptra pale yellowish-green, with a brownish apex, always naked, covering half the capsule.

This species is readily known from *O. tenellum* by its pale colour, and by the naked calyptra. It differs from *O. fallax* in the form of the leaves, in the peristome, and in the paler and more cylindrical capsule when dry. *Orthotrichum Rogeri* Brid. has the leaves more obtuse, yellowish-green, with larger areolæ and nearly plane margins, the calyptra yellowish-brown, and the capsule wider, and more contracted below the mouth when dry. *O. Braunii* Br. and Sch. is a smaller moss, with small pyriform pedicellate capsule, reddish-brown calyptra, and acute leaves.

179. 6. *Orthotrichum stramineum* Hornsch. (*straw-coloured Bristle-Moss*); stems tufted, branched; leaves spreading, loosely imbricated when dry, lanceolate, keeled, margin reflexed; capsule oblong-pyriform, pedicellate, widely striated; calyptra campanulate, slightly hairy; cilia 8 or 16; vaginula hairy. (Tab. XLV.)

O. stramineum *Hornsch.* ined. *Brid.* Bryol. Univ. *Bruch and Sch.* Bryol. Europ. p. 23. t. 13.
O. alpestre *Hornsch.* ined.

Hab. On trees and on detached rocks. Scotland, Wales, and England; probably not unfrequent. Fr. June, July.

Growing in tufts or in broad patches, often intermixed with *O. affine*, but of rather smaller size, with narrower leaves, which are lanceolate, acuminate, with revolute margins, those of the perichætium erect. Vaginula hairy. Capsule exserted and pedicellate, the pedicel longer than in the next, ovate-pyriform, of thick texture, yellowish brown, with 8 broad striæ of a deeper tint, scarcely contracted below the mouth when dry. Lid conical-convex, with a short beak and reddish border. Peristome composed of 8 yellowish teeth, reflexed when dry, and 16 yellowish cilia, of which the alternate ones are usually shorter than the rest and sometimes wanting. Calyptra campanulate, covering two thirds of the capsule, straw-coloured, purplish at the apex, and sometimes at the base, slightly hairy.

Nearly allied to *O. patens* Bruch, and to *O. fastigiatum* Bruch, but the capsule is of thicker texture, more highly coloured, ripening at a later season. *O. patens*, which has also a hairy vaginula, has the calyptra more hairy and of a yellow colour, the capsule paler. From *O. affine*, *O. stramineum* is readily distinguished by the calyptra, vaginula, peristome, and indeed by the whole habit of the plant.

180. 7. *Orthotrichum fastigiatum* Bruch (*close-tufted Bristle-Moss*); stems densely tufted, branched; branches fastigiate; leaves suberect or spreading, imbricated when dry, ovate-lanceolate; capsule oblong-pyriform, pedicellate, widely striated; calyptra campanulate, yellowish, hairy. (Tab. XLV.)

O. fastigiatum *Bruch*, in *Brid.* Bryol. Univ. *Bruch and Schimp.* Bryol. Europ. p. 18. t. 8.
O. affine *Schwaegr.* Suppl. i. 2. 19. t. 49.

Hab. On trees in open fields, never in woods, seldom on rocks. Rare in England, or frequently overlooked. Near Greta Bridge, Yorkshire, and Scale Hill, Sussex, *Mr. Borrer.* Near Newcastle, *Mr. Winch*, in *Herb. Turner.*
Fr. May, June.

Stems more densely tufted than in *O. affine*, with shorter and broader leaves, imbricated and erect when dry, gradually acuminated, much less conspicuously papillose, and the areolæ more lax. Capsule thicker and more pyriform, with wider striæ; the lid larger. Cilia of the inner peristome shorter and broader, and the calyptra yellowish-brown, or almost ferruginous, and more hairy. It is not unlike *O. patens*, but differs in the wider leaves, longer lid, and naked vaginula.

7. 8. *Orthotrichum affine* Schrad. (*common Wood Bristle-Moss*); stems rather tall, tufted, branched, erect or decumbent; leaves spreading, lax when dry, oblong-lanceolate, rather obtuse, margin revolute, papillose; capsule elliptic-oblong, with narrow striæ; calyptra campanulate, hairy. (Tab. XXI.)

O. affine *Schrad.* Spicil. Fl. Germ. p. 67. *Web. and Mohr,* Tasch. p. 233. *Smith,* Fl. Brit. p. 1263.; Eng. Bot. t. 1323. *Turn.* Musc. Hib. p. 96. *Brid.* Bryol. Univ. *Hook. and Grev.* Journ. of Sc. 1824, p. 121. *Bruch and Schimp.* Bryol. Europ. p. 17. t. 8.
O. striatum *Hedw.* St. Cr. 2. t. 36. (fig. 5. only).
Weissia affinis *and* octoblepharis *Roth.*
Orthotrichum anomalum *Dickson,* in *Herb. Turner.*
Dill. Hist. Musc. t. 55. f. 8.

Hab. On trees, very common; sometimes on rocks and walls.
Fr. June, July.

Stems tufted, or in broad patches. Leaves, in the smaller plants, crowded; in the taller plants more scattered, spreading, often recurved, and somewhat twisted, when dry lax, and still somewhat spreading, scarcely imbricated, lower ones oblong-lanceolate, upper ones longer and rather obtuse, revolute, and somewhat undulated in the margin, covered on both sides with prominent papillæ; areolæ dotted. Vaginula naked, rather small, and subcylindrical. Capsule elliptic-oblong, exserted on a rather long pedicel, pale brown or greenish-yellow, with 8 narrow striæ and a tapering apophysis, when dry somewhat fusiform and contracted below the mouth. Lid pale, with a bright red border and longer beak than usual. Calyptra campanulate, covering half the capsule, greenish-yellow, slightly hairy. Teeth of the peristome 8, pale, reflexed when dry; cilia 8, pellucid, filiform, as long as the teeth. Spores green, twice the diameter of those of *Orthot. pumillum,* and most other species.

This species is easily recognised by the coarse foliage and pale greenish calyptra. The capsule, moreover, is paler than in most of the allied species, and of narrower shape and thinner texture than in the last, with a longer pedicel.

2. 9. *Orthotrichum rupestre* Schleich. (*rock Bristle-Moss*); stems loosely cæspitose, elongated, branched, decumbent at the base; leaves spreading, somewhat recurved, lanceolate, erect when dry; capsule pyriform, with 8 faint striæ; calyptra campanulate, very hairy; teeth of the peristome 16, in pairs, erect when dry. (Tab. XXXIV.)

O. rupestre *Schwaegr.* Suppl. i. 2. 27. t. 53. *Brid.* Bryol. Univ. *Hook. and Grev.* Journ. of Sc. 1824, p. 121. *Bruch and Schimp.* Bryol. Europ. p. 19. t. 9.

var. β. rupincola; leaves suberect; capsule smaller.

O. rupincola *Funck. Bridel,* Bryol. Univ. *Hook. and Grev.* Journ. Sc. p. 122. *Grev.* Scot. Crypt. Fl. t. 105. *Hook. and Tayl.* Musc. Brit. ed. 2. p. 127. tab. xxxiv.
var. γ.; stem longer; capsule exserted; calyptra very hairy.
O. Sehlmeyeri *Hornsch. Brid.* Bryol. Univ.

Hab. On rocks, chiefly in mountainous districts.
Fr. July, August.

Stems growing in loose patches (in the var. β. more densely tufted), branched; branches erect. Leaves rather crowded, more or less spreading and recurved, when dry erect and loosely imbricated, lanceolate, acute, or somewhat acuminated, the margins recurved, those of the perichætium erect, and almost sheathing. Vaginula naked, oblong. Capsule pyriform, on a pedicel varying in length, usually rather short, the apophysis tapering into the pedicel, pale brown, faintly marked with 8 striæ, when dry faintly ribbed in the upper part only (as in *O. Sturmii*), and not obviously contracted below the mouth. Lid convex, with a short beak. Calyptra covering the greater part of the capsule, campanulate, yellow, covered with longer hairs than in most of the allied species. Outer peristome consisting of 16 pale teeth in pairs, at length (in a dry state) separate and almost equidistant, erect, or, when old, slightly spreading; cilia 8, linear-lanceolate. Spores brown, small.

In general appearance, and especially as to the capsule, this species most resembles *O. Sturmii*, from which, in the absence of the calyptra and peristome, it would not be easy to distinguish it. In the leaves, however, it agrees more closely with *O. anomalum.* The very hairy calyptra, and slightly ribbed capsule, are characters by which it is most easily recognised. With *O. affine* it will not be liable to be confounded, after due attention has been paid to the characters above given.

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10. *Orthotrichum speciosum* Nees ab Es. (*showy Bristle-Moss*); stems elongated, loosely tufted, branched; leaves spreading, lanceolate, with recurved margins; capsule exserted, elliptic-oblong, faintly striated; calyptra conico-campanulate, very hairy; teeth of the peristome in 8 pairs, reflexed when dry. (TAB. XXXIV.)

O. speciosum *Nees v. Esenb.* in Sturm. Deutsch. Fl. *Brid.* Bryol. Univ. *Hook. and Grev.* Journ. Sc. p. 124. *Hook. and Tayl.* Musc. Brit. ed. 2. p. 130.; Tab. Suppl. iv. *Bruch and Schimp.* Bryol. Europ. p. 19. t. 9.
O. striatum *Hedw.* St. Cr. t. 36. f. 3. *Dill.* Hist. Musc. p. 430., ex parte?

Hab. On trees; rare. Near Montrose, and in Corrie Moolzie, near Castletown, Braemar, Scotland. Fr. July, August.

Stems longer than in *O. affine*, and more rigid, especially when dry; loosely tufted. Leaves spreading and recurved, when dry erect and loosely imbricated, lanceolate, acuminate, coarsely papillose, the margin revolute; perichætial leaves erect or slightly spreading. Vaginula oblong, slightly hairy. Capsule exserted, elliptic-oblong, yellowish, faintly marked with 8 striæ, when dry cylindrical and faintly ribbed in the upper part, when old pale brown, the apophysis tapering into the pedicel, which is longer than in the allied species. Outer teeth of the peristome yellowish; cilia 8. Lid conical, with a short beak and red border. Calyptra covering two thirds of the capsule, yellowish, with longer and more copious hairs than in the allied species, except *O. rupestre*.

This is known from *O. affine* and the allied species by the cylindrical, exserted, and faintly ribbed capsule. The American *O. elegans* Hook. and Grev. cannot easily be distinguished from it, unless by the perfectly smooth capsule, in which it more resembles if it be not identical with *O. leptocarpum* Br. and Sch.

4. 11. *Orthotrichum Lyellii* Hooker (*Mr. Lyell's Bristle-Moss*); dioicous; stems loosely tufted, elongated, incurved below, the branches nearly erect; leaves crowded, widely spreading, flexuose, erect when dry, linear-lanceolate; capsule oblong-pyriform, striated; calyptra hairy; teeth of the peristome 16, reflexed when dry; cilia 16, articulated, broad, carinate. (TAB. XXII.)

O. Lyellii *Hook. and Tayl.* Musc. Brit. p. 129. t. 22. *Hook. and Grev.* Journ. Sc. p. 124. *Bruch and Schimp.* Bryol. Europ. p. 27. t. 16. *Eng. Bot.* Suppl. t. 2834.

Hab. On trunks of old trees; not common; rare in fruit.
Fr. July.

One of the largest species, growing in loosely aggregated patches or tufts, the stems loosely cohering by means of fibrous radicles, from 2 to 4 inches long, much branched, the branches curved upwards as in *Leucodon sciuroides*. Leaves pale or yellowish-green, widely spreading and somewhat recurved, almost squarrose, when dry nearly erect and irregularly curved, linear-lanceolate, longer than in most of the species, rather flaccid, wavy or flexuose, margin nearly plane, subserrulate, especially at the apex, beset with very prominent cylindrical papillæ, and also with brownish articulated gland-like bodies (*Conferva Orthotrichi*) analogous to the secondary radicles found on the stem; perichætial leaves longer than the rest. Vaginula slightly hairy. Capsule elliptic-oblong, with an apophysis tapering into a pedicel of the same length as in *O. affine*; pale yellowish-brown, with 8 very faint striæ, when dry with an equal number of deep furrows; scarcely contracted below the mouth. Lid conical with a short beak, the border scarcely coloured red. Calyptra conic-campanulate, covering the whole capsule, yellowish, brown at the apex, moderately not copiously hairy, the hairs whitish, rather long. Outer teeth of the peristome 16, whitish; cilia 16, red, carinate, with traces of trabeculæ, irregularly toothed or erose in the margin, incurved when dry, and then almost hidden from view. Spores larger than in most of the species, green, nucleate, almost smooth. Barren flowers occur on separate plants; hence the rarity of fruit in this species may be accounted for, none being found when the barren-flowered plants are absent.

Orth. Lyellii cannot be confounded with any British species; the robust habit and long spreading leaves, more conspicuously papillose than even those of *O. affine*, serve to distinguish this from all others, without reference to the fructification.

5. 12. *Orthotrichum rivulare* Turner (*river Bristle-Moss*);

stems flaccid, tufted, elongated, branched, decumbent; leaves flaccid, spreading, loosely imbricated when dry, oblong-ovate, obtuse, with recurved margins; capsule pear-shaped, widely striated; calyptra naked; teeth in 8 pairs, reflexed when dry; cilia 16. (TAB. XXI.)

O. rivulare *Turn.* Musc. Hib. p. 96. t. 8. *Smith,* Fl. Brit. p. 1266.; Eng. Bot. t. 2188. *Hook. and Tayl.* Musc. Brit. *Schwaegr.* Suppl. *Hook. and Grev.* Journ. Sc. *Bridel,* Bryol. Univ. *Bruch and Schimp.* Bryol. Europ. p. 25. t. 14.

Hab. On rocks and on trunks and branches of trees at the borders of rivulets in Ireland, England, and Wales; not common; and chiefly confined to hilly districts near the sources of rivers, as near Congleton, Cheshire; Nant y Belan, by the river Dee, near Wynnstay. Fr. April, May.

Stems often floating in water, especially in winter; more or less branched in the upper part, the branches fasciculate, below denuded of leaves. Leaves lurid green, flaccid, spreading, sometimes obliquely twisted or subsecund, when dry erect, and loosely imbricated, oblong-ovate or oblong, the upper ones almost ligulate, obtuse, the nerve very strong and prominent, the margin recurved below, nearly plane above; areolæ smaller than usual, and beset with very minute papillæ; perichætial leaves erect. Vaginula short, naked. Capsule half immersed in the leaves, pyriform, pale brown, with 8 broad striæ, on a very short pedicel, ribbed and nearly cylindrical when dry. Lid with a moderately long beak. Calyptra covering more than half of the capsule, campanulate, membranous, dull green, destitute of hairs. Outer peristome at first in 8 principal divisions, yellowish, reflexed when dry, at length more or less divided into 16 teeth; cilia 16, pale, slender, the alternate ones shorter. Spores green.

The obtuse flaccid leaves of this species distinguish it from all but the following species, and especially from dark-coloured varieties of *O. affine*, which is sometimes found in similar situations.

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13. *Orthotrichum Sprucei* Montagne (*Mr. Spruce's Bristle-Moss*); stems short, tufted, sparingly branched; leaves moderately spreading, erect and imbricated when dry, oblong-spathulate or ligulate, obtuse, apiculate, flaccid, obscurely nerved, margin nearly plane; capsule pyriform, widely striated; calyptra campanulate, naked; lid short, subconical; teeth in 8 pairs, reflexed when dry; cilia 8—16. (TAB. XLV.)

O. Sprucei *Montagne MS. Bryol. Eur.* fasc. 42. t. 2.

O. Rogeri var. *Arnott,* in lit.

Hab. On trees, &c. near rivers, about York and near Matlock, *Mr. Spruce.* Near Bristol, *Mr. Thwaites.* First found near Glasgow, on the banks of the Clyde, in 1824, by *Mr. T. Drummond.* Banks of the Thames, near Wandsworth, *Mr. Sowerby.* Fr. May, June.

Stems about ¼ in. long, rather closely tufted, very sparingly branched. Leaves flaccid, erecto-patent, when dry erect and imbricated, not much crowded, lurid green, ligulate, oblong-elliptical, or somewhat spathulate, varying in form, but always wider in the upper half than those of *H. rivulare*, obtuse with a very small obscure apiculus, slightly reflexed in the margin, the nerve very thin and narrow; areolæ large as in *O. diaphanum*, not papillose; perichætial leaves elliptical, erect. Vaginula small and short, naked. Capsule pyriform, half immersed, the apophysis less tapering into the short pedicel than in the last, with 8 broad striæ, when dry contracted below the mouth, of thick texture, brown. Lid smaller and shorter than in the last, conical, with a very short beak, red-bordered. Teeth buff-coloured, reflexed when dry; cilia 8, of equal length, sometimes 16, the intermediate ones shorter. Calyptra greenish, lurid at the apex, or occasionally pale yellow and reddish at the apex, without hairs, covering two-thirds of the capsule. Spores greenish, as large as in the last species. Inflorescence monoicous.

Certainly distinct from *O. Rogeri* Bridel, with which it has been confounded, until Mr. Spruce detected it as a new species. It differs from *O. Rogeri* in the form, texture, and colour of the leaves, which indeed resemble those of no other species, except *O. rivulare*, which has leaves of closer texture and very strongly nerved, destitute of the apiculus which is so characteristic of the moss now before us. In the capsule and in size and general aspect it is allied to *O. pumilum* and to *O. Rogeri.*

87 14. *Orthotrichum diaphanum* Schrad. (*white-tipped Bristle-Moss*); stems loosely tufted, sparingly branched; leaves subflaccid, spreading, when dry loosely imbricated, ovato-lanceolate, acuminate with slender diaphanous points, the margin revolute; capsule oblong-pyriform, substriated; calyptra campanulate, mostly naked, teeth 16, spreading when dry; cilia 16. (TAB. XXI.)

O. diaphanum *Schrad.* Spicil. Fl. Germ. p. 69. *Dickson,* Crypt. iv. t. 10. f. 12. *Web. and Mohr,* Tasch. p. 234. *Turn.* Musc. Hib. p. 99. t. 9. f. 1. *Smith,* Fl. Brit. p. 1265.; Eng. Bot. t. 1324. *Hook. and Tayl.* Musc. Brit. *Schwaegr.* Suppl. i. 2. p. 31. t. 55. *Brid.* Bryol. Univ. *Hook. and Grev.* in Journ. Sc. p. 123. *Bruch and Schimp.* Bryol. Europ. p. 26. t. 14.

O. aristatum *Turn.* Musc. Hib. p. 100. t. 9. f. 2. *Smith,* Fl. Brit. p. 1265.

Weissia diaphana *Roth.*

Hab. Trees, walls, roofs, and old pales. Fr. April.

Stems short, dichotomous. Leaves almost piliferous, the acuminated part diaphanous and subserrulate, margin recurved, cellules large. Capsule oblong-oval, half immersed, pale yellowish-brown, of very thin texture, and very obscurely ribbed when dry, when old almost as smooth as in *O. leiocarpum.* Calyptra naked, sometimes with a few scattered hairs, pale yellowish-brown. Teeth 16, equidistant, pale yellow, linear-lanceolate, often split at the apex, when dry spreading or reflexed; cilia 16, erect or connivent. Easily distinguished by the leaves from all other species.

c. Capsule destitute of furrows.

188. 15. *Orthotrichum leiocarpum* Bruch and Schimp. (*smooth-fruited Bristle-Moss*); stems loosely tufted, elongated, branched; leaves spreading, erect when dry, lanceolate, margin revolute; capsule large, obovate, smooth; calyptra campanulate, hairy; teeth 16, revolute when dry; cilia 16, eroso-articulate, incurved. (TAB. XXI.)

> O. striatum *Hedw.* Sp. Musc. p. 163. *Dickson. Smith,* Fl. Brit. p. 1263.; Eng. Bot. t. 2187. *Turn.* Musc. Hib. p. 95. (excl. var. β.)? *Schwaegr.* Suppl. i. 2. p. 29. t. 54. *Swartz,* Suec. p. 42. *Web. and Mohr,* Tasch. p. 234. *Brid.* Bryol. Univ. *Hook. and Tayl.* Musc. Brit. tab. xxi.
>
> O. leiocarpum *Bruch and Schimp.* Bryol. Europ. p. 28. t. 15.
>
> Weissia striata *Roth.*

Hab. On trees. Fr. April, May.

Growing in patches or tufts. Stems 1—3 inches long. Leaves almost appressed when dry, margin much revolute. Vaginula naked, or at times hairy. Capsule very pale brown, quite destitute of striæ, and perfectly smooth when dry, not contracted below the mouth; the pedicel short. Calyptra campanulate, covering half the capsule, straw-coloured, or brownish, more or less hairy, sometimes naked.

This being the only European species with a perfectly smooth capsule, it must be confessed that the old name was extremely inappropriate. The figures and description in Hedwig, *Strip. Crypt.* vol. 2. t. 36., relate to three species; viz. *O. speciosum* (*fig.* 3.), *O. affine* (*fig.* 5.) and *O. leiocarpum* (*fig.* 9.); the name *striatum* being retained, by a singular mistake, for this species.

B. Capsule much exserted, on a longer pedicel.

a. Calyptra naked.

189. 16. *Orthotrichum pulchellum* Smith (*elegant Bristle-Moss*); stems dwarfish, somewhat tufted, sparingly branched; leaves spreading, subflaccid, somewhat crisped when dry, linear-lanceolate, margin recurved; capsule on a long pedicel, oval, striated, when dry 8-ribbed; calyptra campanulate, naked; teeth of the peristome 16, approaching in pairs, reflexed when dry; cilia 16. (TAB. XXI.)

> O pulchellum *Smith,* in Eng. Bot. t. 1787. *Hook. and Grev.* Journ. Sc. p. 127. *Hook. and Tayl.* Musc. Brit. *Bruch and Schimp.* Bryol. Europ. p. 30. t. 18.
>
> O. stenocarpum *Brid.* Bryol. Univ.

Hab. On trunks of trees, sometimes on walls. Fr. May.

Stems loosely cæspitose, about ¼ inch long, sparingly branched. Leaves pale green, and tender, lax and slightly crisped when dry; hence the species approaches very nearly to those of the next section, especially *O. crispulum* and *O. curvifolium*; recurved or revolute in the margin, those of the perichætium nearly equalling the pedicel in length. Capsule pale yellowish-green, with 8 reddish striæ, when dry ribbed, not contracted below the mouth. Lid with a red border and short beak. Outer peristome of a fine red colour; cilia filiform, of equal length. Calyptra pale yellowish, quite destitute of hairs, campanulate, purplish at the apex and base.

The red peristome with 16 cilia, and the naked calyptra, at once distinguish this moss from *O. crispulum* and its allies, and it is not likely to be confounded with any other species; it is one of the most beautiful of the genus.

b. Calyptra very hairy, with numerous furrows; ochrea indistinct; leaves crisped when dry, dilated at the base. *Ulota* Bridel. *Ulotrichum* Bryol. Eur. (Conspectus).

90, 17. *Orthotrichum Ludwigii* Schwaegr. (*club-fruited Bristle-Moss*); stem creeping or decumbent, branched; leaves somewhat fascicled, spreading, when dry slightly twisted, linear-lanceolate; capsule exserted, on a long pedicel, obovate, smooth below, when dry plicate and contracted at the mouth; calyptra conic-campanulate, hairy. (TAB. XXXIV.)

O. coarctatum; caule suberecto ramoso, ramis inclinatis; foliis linearibus, siccitate crispis, costa integra notatis; pyxidibus erectis, pyriformibus; orificio striato, coarctato; calyptra pallida, hirta. *P. Beauv.* Ætheog. Prodr. p. 80.!

O. Ludwigii, *Schwaegr.* Suppl. i. 2. 24. t. 51. *Hook. and Grev.* Journ. Sc. p. 125. *Hook. and Tayl.* Musc. Brit. *Bruch and Schimp.* Bryol. Eur. p. 12. t. 4.
Ulotrichum Ludwigii *Bryol. Eur.* (Conspectus).
O. clausum *Hornsch.*
Splachnum Wulfenianum *Schwaegr.* Suppl. t. 14.

Hab. Scotland, on trees; most frequent on young oaks in alpine glens. Ireland, rare. Fr. August and Sept.

Leaves yellowish-green, suberect, irregularly curved, when dry more or less contorted, concave and ovate at the base, linear-lanceolate above, and narrower than in most of the allied species; the margin plane, somewhat undulated; those of the perichætium longer, erect, plicate below. Vaginula hairy or naked, destitute of the ochrea. Capsule pale brown, pear-shaped, furrowed only at the top, and the mouth when dry remarkably contracted, the bases of the teeth literally meeting together. Peristome, 16 teeth, paired, recurved, at length equidistant and erect, pale. The existence of an inner peristome is disputed by Bruch and Schimper; but we have occasionally found cilia in recent specimens, about one third the length of the teeth, and extremely slender.

The inconvenience of disturbing names long in use deters us from adopting P. Beauvois' name *O. coarctatum*, which strictly belongs to this moss. The short description above quoted is very expressive and appropriate. This species is readily known by its peculiar capsule, and is allied to *Macromitrium microstomum*.

91. 18. *Orthotrichum crispulum* Hornsch. (*dwarf curled Bristle-*

Moss); stems tufted, branched; leaves crowded, linear-lanceolate, crisped when dry; capsule clavate-pyriform, with 8 narrow ribs; calyptra conic-campanulate, very hairy. (Tab. XLV.)

O. crispum β. minus *Schwaegr.* Suppl. i. 2. p. 25.
O. cirrhatum *Bernhardi.*
O. crispulum *Bryol. Eur.* fasc. 2, 3. p. 23. t. 12.
Ulotrichum crispulum *Bryol. Eur.* (Conspectus).
Ulota crispula *Bridel,* Bryol. Univ. i. 793.

Hab. On trees, but not common. Near Ambleside, with *O. crispum.* Westmoreland, *Mr. Sidebotham.* Sussex, *Mr. Mitten.* Yorkshire, *Mr. Spruce.* Fr. May, June.

A more delicate moss than the next; the leaves narrower and less crisped when dry. Capsule shorter and smaller, very pale, of thin membranous texture, when dry oval, not contracted below the mouth; the ribs narrow and faintly marked; the pedicel thinner; the apophysis shorter, and not so gradually tapering. Spores green. In aspect and character it is intermediate between *O. crispum* and *O. curvifolium.* From the former of these it differs in the season at which the fruit ripens: a few stomata are visible on the apophysis.

192 19. *Orthotrichum crispum* Hedw. (*curled Bristle-Moss*); stems tufted, branched; leaves crowded, spreading, contorted, much twisted and crisped when dry, linear-lanceolate, ovate and dilated at the base, slightly undulated; capsule clavate, with a long tapering apophysis, widely striated, contracted below the mouth; calyptra campanulate, very hairy. (Tab. XXI.)

O. crispum *Hedw.* St. Cr. t. 35. (ex parte.) Sp. Musc. p. 162. *Dickson. Schwaegr.* Suppl. i. 2. p. 23. *Smith,* Fl. Brit. p. 1266.; Eng. Bot. t. 996. *Hook. and Grev.* Journ. Sc. p. 126. *Bruch and Schimp.* Bryol. Eur. p. 23. t. 12.
Ulota crispa *Bridel,* Bryol. Univ.

Hab. On trees, frequent. Fr. July, August.

Leaves considerably more crisped when dry than in the two allied species. Capsule paler and smaller than in the next, with a shorter, coarse, thick pedicel, into which the long apophysis imperceptibly passes, giving a narrow clavate aspect to the capsule, which in a dry state is contracted just below the mouth, and has 8 rather broad ribs, or furrows, continued far down into the pedicel, which on account of its thick substance is very slightly twisted. Inner peristome composed of 8, or sometimes 16, cilia, wider than in *O. Bruchii,* consisting of a double series of cells. Lid shorter than in that species. Spores brown, small.

193. 20. *Orthotrichum Bruchii* Bridel (*tawny-fruited Bristle-Moss*); stems tufted, decumbent or erect, branched; leaves spreading, crisped when dry, linear-lanceolate; capsule on a longer pedicel, oblong-pyriform, widely striated, when dry contracted at the mouth; calyptra conic-campanulate, very hairy. (Tab. XLV.)

O. coarctatum *Bruch and Schimp.* Bryol. Europ. p. 21. t. 11. (excl. syn.)
Ulotrichum coarctatum *Bryol. Eur.* (Conspectus) (not *P. Beauv.*; perhaps *Schwaegr.* Suppl. i. 2. 26. t. 52.)
Ulota Bruchii *Brid.* Bryol. Univ. i. 794.

Hab. On trees. Not uncommon in Scotland. Westmoreland. Yorkshire. Sussex. Fr. July, August.

Stems tufted or cæspitose, erect or decumbent. Leaves linear-lanceolate, dilated and ovate at the base, the margin plane above, reflexed below, crisped and contorted when dry, but less so than in *O. crispum*, often undulated; the lower leaves reddish-brown, the upper ones yellowish-green; perichætial leaves longer, broader, erect. Vaginula oblong, mostly hairy. Capsule pyriform, yellowish-brown, of thick texture, with 8 broad striæ, when dry and empty fusiform, much narrowed towards the mouth, the pedicel as long as the perichætial leaves, or even longer. Lid convex, with a beak of moderate length. Calyptra conic-companulate, with numerous furrows, as in all the species allied to this, covering half the capsule, of a blackish-yellow colour and very hairy. Teeth of the peristome 16, paired, reflexed when dry; cilia filiform, 8, rarely 16, narrower than in the last. Spores green, larger than those of *O. crispum.*

The dark hue of the foliage, long pedicel, narrow capsule when dry and empty, and its texture and colour, all serve to distinguish this moss at sight from the two last species. We have already shown that this is not the plant of *P. Beauv.*; and we do not quite recognise it in the figure of Schwaegrichen, which shows the leaves too narrow, the calyptra scarcely hairy, and more like *O. luteolum* Hook. fil. & Wils., which is *O. coarctatum* of Hook. & Greville, Journ. Sc. p. 125.

The three species, just described, appear to have been confounded by Hedwig and Dillenius; we therefore omit the citation of the figures given by these authors, which cannot be determined without recourse being had to the original specimens.

34- 21. *Orthotrichum Drummondii* Hook. and Grev. (*Mr. Drummond's Bristle-Moss*); stem creeping, branched; branches erect; leaves crowded, spreading, linear-lanceolate, appressed when dry, keeled along the nerve, margin almost plane; capsule oblong, pear-shaped, striated, exserted on a long pedicel; calyptra conical-campanulate, hairy, laciniated at the base. (TAB. XXXIV.)
O. Drummondii *Hook. and Grev.* Monogr. p. 120. *Musc. Brit.* ed. 2. *Bryol. Eur.* fasc. 2, 3. p. 12. t. 3.
Ulotrichum Drummondii *Bryol. Eur.* (Conspectus).
Ulota Drummondii *Bridel.*

Hab. On trunks of young trees, chiefly birches. Scotland. Turk Mountain, Ireland. Teesdale, *Mr. Spruce.* Fr. Aug.

A beautiful species, differing from *O. crispum* and most of its allies by its creeping stems, approaching in its mode of vegetation to the genus *Macromitrium.* Leaves more or less spreading, when dry almost straight and erect, scarcely at all crisped, linear-lanceolate from an ovate base, yellowish-green. Vaginula naked or hairy. Capsule pale brown, on a long pedicel, narrow, when dry contracted below the mouth, and furrowed. Lid pale and conical. Calyptra yellowish-brown, covered with long rigid hairs. Peristome of 16 pale teeth in pairs, reflexed when dry, but not strongly so.

This species differs from *O. Bruchii* in the peristome and in the form of leaves, which are scarcely crisped when dry.

195. 22. *Orthotrichum Hutchinsiæ* Smith (*Miss Hutchins' Bristle-Moss*); stems somewhat tufted, branched; leaves crowded, erecto-patent, erect and nearly straight when dry, lanceolate; capsule clavate-pyriform, striated; calyptra conical-campanulate, hairy. (TAB. XXI.)

O. Hutchinsiæ *Smith*, Eng. Bot. t. 2523. *Schwaegr.* Suppl. ii. 2. 138. *Hook. and Tayl.* Musc. Brit. *Hook. and Grev.* Journ. Sc. p. 125. *Bruch and Schimp.* Bryol. Eur. p. 20. t. 10.
O. Americanum *P. Beauv.* *Swaegr.* Suppl. ii. 2. p. 144. t. 138. *Brid.* Bryol. Univ.
O. strictum *Brid.*
Ulotrichum Hutchinsiæ *Bryol. Eur.* (Conspectus).

Hab. On rocks in mountainous districts, in Wales, Ireland, and Scotland. Devonshire (vide *Musc. Brit.*). Fr. July.

Stems aggregated in patches or tufts, which are brittle and loose when handled, rather rigid. Leaves suberect, when dry almost erect and appressed, lanceolate, keeled, the margin very little reflexed, strongly nerved to the apex, opaque and of close texture, the lower ones of a dusky hue, those of the perichætium longer and erect. Vaginula oblong, slightly hairy. Capsule subclavate, with the apophysis tapering gradually into the long pedicel, brownish, with 8 broad striæ, furrowed when dry and slightly narrowed below the mouth, when old fusiform. Lid conical, with a rather long beak. Calyptra covering nearly the whole capsule, yellowish, copiously hairy. Outer peristome composed of 16 paired teeth, reflexed when dry; cilia 8, short, and somewhat fugacious. Spores brown, small.

This species is nearly allied to *O. curvifolium* Wahlenb., not yet observed in Britain. That species differs from *O. Hutchinsiæ* in having the leaves more lax and curved when dry, less rigid, papillose, and subserrulate; it is intermediate between *O. Hutchinsiæ* and *O. crispulum.*

O. nigritum Bruch and Schimper, does not appear to be specifically distinct from *O. Hutchinsiæ.* We have gathered specimens on Mael Dun Crosk, near Killin, exactly corresponding with the description, in every point, except that the peristome is double, and we know that the presence or absence of the cilia in *O. Hutchinsiæ* and other species is not to be relied on. We therefore consider *O. nigritum* to be merely an alpine state of *O. Hutchinsiæ*, having the stems more slender, leaves more crowded, and when dry more erect, of a dark blackish colour, capsule smaller, pedicel shorter, and the calyptra less hairy.

196. 23. *Orthotrichum phyllanthum* Bruch and Schimper (*frizzled Bristle-Moss*); stems subcæspitose or tufted, simple or sparingly branched; leaves linear-lanceolate, elongated, nerved to the apex, suberect and straight, when dry crisped, gemmiparous at the apex. (TAB. XLVI.)

O. phyllanthum *Bryol Eur.* fasc. 2, 3. p. 30. t. 18.
O. jutlandicum *Bridel,* Bryol. Univ. *C. Müller,* Syn. Musc.
Gymnostomum viridissimum *Davies,* Welsh Botanology, p. 103. (not of *Smith.*)
Ulotrichum phyllanthum *Bryol. Eur.* (Conspectus).

Hab. On rocks near the sea. Near Holyhead, and near Conway; also on trees, near Bangor, N. Wales. Yorkshire, *Mr. Spruce.* Sussex, *Mr. Mitten.* Always barren.

In many of its characters this greatly resembles *O. crispum.* Leaves longer, crowded, more erect when moist, not dilated at the base, and of a paler yellowish-green colour. The enlarged diaphanous cellules wanting at the base, except a single row at the reflexed margin. It grows at the highest point of vegetation on Chimborazo, in S. America, and at Cape Horn, in loose tufts, 1—2 inches in height.

SUBORDER XV. ZYGODONTEÆ.

38. ZYGODON *Hook. and Tayl.* Yoke Moss.

Perennial mosses, growing in tufts or in large patches upon trees or rocks, in habit similar to *Gymnostomum,* but in structure more nearly allied to *Orthotrichum.*

Stems dichotomously branched; *branches* fastigiate, fertile at the apex. *Leaves* linear-lanceolate, lanceolate, or oblong, keeled, nerved nearly or quite to the apex, margin plane; *areolæ* guttulate.

Capsule erect, pyriform, striated, apophysate, immersed or exserted. *Calyptra* small, cuculliform, smooth, oblique. *Lid* obliquely rostrate. *Annulus* scarcely any. *Peristome* double, single, or entirely absent in some species; *outer teeth* composed of 32 primary divisions, united two or four together, so as to represent 16 or 8 plane teeth, formed of one layer of quadrangular cellules, converging when moist, spreading or reflexed when dry; *inner peristome* of 8 or 16 cilia, alternating with the outer teeth, very narrow, pellucid, simple, erect or horizontal when dry. *Spores* rather small, smooth.

Inflorescence dioicous, monoicous, or synoicous. *Barren flower* terminal or lateral, gemmiform; *antheridia* subcylindrical; *paraphyses* filiform. *Fertile flower* terminal, gemmiform; *archegonia* with or without paraphyses.

Zygodon is distinguished from *Orthotrichum* by the small, smooth, cuculliform calyptra, and by the longer obliquely rostrate lid; the leaves also are narrower, more acute, and the margins are never revolute. Some species, especially those which have no peristome (referred to *Gymnostomum* by most authors), have a distinct perichætium. Name from *ζυγος, a pair,* and *οδων, tooth,* in allusion to the paired teeth.

a. Peristome none.

* Capsule on a short pedicel. *Amphidium* Br. Eur.

197. 1. *Zygodon Lapponicus* Br. and Sch. (*Lapland Yoke-Moss*); monoicous; stems cæspitose, branched; leaves spreading, crisped when dry, linear-lanceolate, carinate, the nerve ceasing below the apex; perichætial leaves sheathing, ovate-lanceolate; fruitstalk short, included in the perichætium; capsule turbinate, urceolate when dry, 8-striate; lid with a short beak. (Tab. VI.)

Zygodon lapponicus *Bryol. Europ.* fasc. 4. p. 6. t. 1.
Amphidium lapponicum *Bryol. Europ.* (Conspectus).
Gymnostomum lapponicum *Hedw.* St. Cr. 3. t. 5. A. *Smith*, Eng. Bot. t. 2216. *Web. and Mohr. Nees and Hornsch.* Bryol. Germ. t. 11. f. 27. *Hook. and Tayl. Bridel.*
Schistidium *and* Gymnostomum striatum *Bridel.*
Bryum lapponicum *Dickson.*

Hab. In the crevices of alpine rocks. Scotland and Wales. Fr. Summer.

Stems ½—1 inch long, and more, beset with radicles, rather fragile. Leaves crowded, crisped and contorted when dry, margin plane, upper ones yellowish-green, lower ones brown, areolation very small and opaque. Capsule scarcely exserted beyond the sheathing perichætium, marked with 8 reddish striæ or ribs, which are very prominent when dry; when fully ripe and empty, wide-mouthed and constricted below. Calyptra brownish, covering little more than the lid, which is scarcely half the length of the capsule. Barren flowers gemmiform, at first terminal, at length lateral, shortly pedicellate, often clustered.

198. 2. *Zygodon Mougeotii* Br. and Sch. (*Mougeot's Yoke-Moss*); dioicous; stems cæspitose, branched; leaves spreading and recurved, scarcely twisted when dry, linear-lanceolate, tapering, carinate, margin reflexed, nerved to the apex; perichætial leaves longer, slightly sheathing; capsule turbinate, urceolate when dry, striated; lid with a longer beak. (Tab. XLVI.)

Zygodon Mougeotii *Bryol. Eur.* fasc. 4. p. 7. t. 1.
Amphidium Mougeotii *Bryol. Eur.* (Conspectus).
Gymnostomum nimbosum *Taylor*, in lit.

Hab. On moist shady rocks, very rare in fruit. The only British specimen in fruit was gathered by *Prof. Walker Arnott* on the Scottish (Clova?) Mountains, growing amongst *Z. lapponicus.* In a barren state this moss is very frequent. Fr. Summer.

This species differs thus from *Z. lapponicus.* Stems more branched, less covered with radicles. Leaves somewhat fascicled or whorled, occasionally trifarious, longer, narrower, more tapering, the margin reflexed below, slightly crisped and inflexed, but not twisted when dry, areolation more distinctly dotted; perichætial leaves twice as long, narrower, less concave, nerved to the apex. Fruitstalk longer. Lid with a longer beak, nearly as long as the capsule. Inflorescence dioicous.

** Fruitstalk longer.

9 3. *Zygodon viriaissimus* Brid. (*green-tufted Yoke-Moss*); dioicous; stems tufted, branched, fastigiate; leaves widely spreading, recurved, broadly lanceolate; capsule obovate, on a long pedicel, obscurely striated; lid with a long beak. (Tab. VI.)

Zygodon viridissimus *Bridel*, Bryol. Univ. i. p. 592, 803. *Br. and Sch.* Monogr. p. 7. t. 1.
Gymnostomum viridissimum *Smith*, in Eng. Bot. t. 1583. *Hook. and Tayl.* *Schwaegr.* Suppl. t. 177.
Dicranum viridissimum *Smith*, in Fl. Brit. *Turner.*

Hab. On trees; occasionally upon rocks, especially such as are calcareous; seldom in fruit. Fr. March, April.

Growing in yellowish-green tufts, ½—1 inch in height. Stems sparingly branched, beset with reddish-brown radicles in the lower part. Leaves widely spreading, recurved, slightly twisted or flexuose, erect, slightly crisped and contorted when dry, widely lanceolate, acuminate, carinate; margin plane; nerve narrow, pellucid, ceasing below the apex; areolæ very small, dot-like; perichætial leaves erect, scarcely different from the rest, not convolute. Fruitstalk 3—6 lin. long, pale. Capsule almost oval, narrowed towards the mouth, obscurely 8-striate, somewhat furrowed when dry, pale yellowish-brown. Lid shorter than the capsule, obliquely rostrate. Calyptra small, brownish, fugacious.

In this, as in other species which have dioicous inflorescence, the fruit is of rare occurrence, and is found only where plants with both kinds of flowers grow near to each other.

b. Capsule furnished with a peristome.

* Inner peristome fugacious.

0 4. *Zygodon conoideus* Dickson (*lesser Yoke-Moss*); dioicous; stems tufted, branched, fastigiate; leaves crowded, moderately spreading, imbricated when dry, broadly lanceolate, carinate, margin plane, nerve ceasing below the apex; capsule oblong-pyriform, striated; lid with a long beak; outer teeth of the peristome 8, short; inner peristome fugacious. (Tab. XXI.)

Bryum conoideum *Dickson*, Cr. Fasc. 4. t. 11. f. 2. *Turner.*
Mnium conoideum *Smith*, Eng. Bot. t. 1239.
Zygodon conoideus *Hook. and Tayl.* Var. *a.* minor *Hook. and Greville*, in Brewst. Edinb. Journ. Sc. vol. i. p. 132.
Zygodon Brebissoni *Bruch and Schimper*, Monogr. p. 8. t. 2.

Hab. Trunks of trees near Inverary, Scotland, *Dickson.* Near

Belfast, Ireland, *Mr. Templeton.* Mucrus, near Killarney. Near Beaumaris, Anglesey. In several parts of England, but seldom in fruit. Fr. May.

Stems more slender than those of *Z. viridissimus*, more copiously beset with rust-coloured radicles. Leaves more erect, straight, not recurved, less crowded, narrower; areolæ larger and more distant; nerve stronger and more opaque. Fruitstalk longer, more slender. Capsule narrower, more gradually tapering below, the mouth wider. Peristome certainly double (single, *Br. and Sch.*), but the inner peristome, consisting of 8 yellowish cilia, is very fugacious, and often absent; outer teeth shorter than in the next species, obtuse, reddish, reflexed (erect, *Br. and Sch.*) when dry, rather fugacious. Spores green, roughish, small. Barren-flowered plants intermixed with the fertile ones; antheridia small (about 8), mixed with longer subclavate paraphyses.

Z. intermedius Br. and Sch., a nearly allied species from Van Diemen's Land, has narrower leaves, elongated stems, and a simple internal peristome of 8 cilia: it is *Z. conoideus β elongatus* of Hook. and Greville.

** Inner peristome persistent.

201. 5. *Zygodon Forsteri* Dickson (*Mr. Forster's Yoke-Moss*); monoicous; stems densely and compactly tufted, branched, radiculose; leaves crowded, erecto-patent, subspathulate or elliptic-lanceolate; capsule pyriform, striated; lid with a curved beak; outer teeth acute, strongly recurved when dry. (TAB. XLVI.)

Bryum Forsteri, capsulis erectis denticulatis, setis adscendentibus, surculis subacaulibus, foliis ovatis. *Dickson*, Cryp. Fasc. 3. p. 4. t. 7. f. 8.

Grimmia Forsteri *Smith* Fl. Brit.! Eng. Bot. t. 2225.!
Weissia Forsteri *Bridel.*
Zygodon conoideus γ. succulentus *Hook. and Greville,* in Edinb. Journ. Sc.
Zygodon conoideus *Bridel. Schwaegr.* Suppl. t. 136. *Bruch and Schimper,* Monogr. p. 8. t. 2.
Amphidium pulvinatum *Nees ab Esenb. Funck,* Moost. t. 22.
Gymnocephalus conoideus *Schwaegr.*
Gagea compacta *Raddi.*

Hab. Trunks of trees in the south of England; rare. Walthamstow, *Mr. T. F. Forster.* Sussex, *Mr. Edw. Jenner.* Fr. Spring.

An authentic specimen of *Grimmia Forsteri* Smith, in the *Herbarium* of Professor Arnott (confirmed by another in *Herb. Turner*), enables us to determine with certainty a moss which has hitherto been confounded with *Zygodon viridissimus*, and with the true *Z. conoideus* of Dickson.

Stems much more compactly tufted than in the preceding species, and interlaced with whitish radicles. Leaves dark green, of firmer texture, more crowded, erect, somewhat incurved when dry, subspathulate, less acute; areolæ larger, hexagonal, those at the base of the leaf oblong and diaphanous; nerve subcontinuous. Seta stouter, yellowish-brown. Capsule reddish-brown, its walls thicker, more strongly ribbed when dry. Outer teeth 8, bigeminate, acute, pale, strongly reflexed when dry; cilia 8, alternating with the outer teeth, shorter, linear-lanceolate, pellucid, erect or slightly incurved when dry. Calyptra reddish-brown. Barren flower terminal on a branch of the fertile stem.

The figure of the magnified leaf in Dickson's work is inaccurate, but we cannot doubt that this is the moss intended by him.

SUBORDER XVI. TETRAPHIDEÆ.

39. TETRAPHIS *Hedw.*

Perennial, growing in dense patches at the decaying roots of old trees, and on shady bànks where the soil is peaty. *Stems* erect, slender, simple, or dichotomous, when old much crowded together, growing from a common base like those of *Schistostega*, bearing small scattered leaves in the lower part, crowned with a tuft of larger, longer, and more crowded leaves at the summit, or with a cup-shaped cluster of very broad leaves surrounding a cluster of pedicellate lentiform gemmæ.

Leaves mostly three-ranked, except at the summit of the fertile stem, ovate-lanceolate, suberect, upper ones larger and spreading, variously curved, entire in the margin; *areolæ* hexagonal; *nerve* ceasing below the apex.

Inflorescence monoicous. *Flowers* gemmiform, terminal; *barren flower* on a branch growing out of an abortive fertile flower; *antheridia* mixed with filiform paraphyses; *archegonia* few.

Capsule terminal, on a long pedicel, erect, subcylindrical, regular, or slightly bent. *Lid* acutely conical, large, of thin texture, pellucid. *Calyptra* mitriform, irregularly plicate, lacerated at the base, covering two-thirds of the capsule. *Peristome* permanently united to the included portion of the columella, which is divided with it into four pyramidal teeth. *Teeth* triquetrous, long, somewhat rigid, not transversely articulated, but marked with numerous irregular longitudinal lines. *Spores* rather small, smooth.

In the calyptra, this genus presents considerable analogy to the *Orthotricheæ*, and there is also much resemblance in the internal structure of the fruit between this and the two preceding suborders; for in all these, that portion of the columella which is included within the peristome separates from the cellular tissue that fills up the interior of the lid above the peristome; and the same structure is observable in *Polytrichum*.

Bruch and Schimper remark that the peristome in this genus does not exhibit the usual composition of 32 primary divisions; and that each of the four teeth has from 8 to 14 longitudinal striæ, the cellular tissue of which they are composed being similar to that of *Buxbaumia aphylla.* Name from τετραφος, *having four prominences.*

202. *Tetraphis pellucida* Hedw. (*pellucid Four-tooth-Moss*). (Tab. VIII.)

Hedw. Sp. Musc. t. 7. f. 1. *Smith*, Eng. Bot. t. 1020. *Schwaegr. Bridel. Hook. and Tayl. Br. and Sch.* Monogr. p. 6. t. 1.

Tetraphis cylindrica *Funck.*
Georgia mnemosyne *Ehrh.*
Mnium pellucidum *Linn. Dill.* Musc. t. 31. f. 2.

Hab. In shady, rocky places, and at the decaying roots of trees; also on banks in a peaty soil. Fr. Aug., Sept.

Stems growing in dense patches, ½—1 inch in height, light green above, reddish below, and at the base connected by matted radicles. Lower leaves of the fertile stem ovate-acuminate or ovate-lanceolate, erect, thinly nerved, reddish like the stem; upper leaves gradually larger, lanceolate or ovate-lanceolate, erecto-patent, light green, all usually three-ranked, slightly carinate, margin plane, entire, nerve ceasing below the apex. Leaves of the gemmiferous cups broadly obcordate. Sometimes the same receptacle which produces a capsule also bears gemmæ, and then the involucral leaves are modified accordingly. Capsules usually solitary, sometimes two together, yellowish-brown, with a red tumid border at the mouth. Fruitstalk above half an inch long, reddish. Peristome inserted below the orifice of the capsule. Calyptra whitish, brown at the apex, with 9—10 furrows. Gemmæ lentiform, on long filiform pedicels (not paraphyses, as supposed by *Bruch and Schimper*). Gemmiferous surculi growing from the centre of the abortive fem. flower.

40. TETRODONTIUM *Schwaegr.*

TETRAPHIS *Hook. and Tayl.* (partly).

Annual or biennial? very minute, growing upon rocks, gregarious.

Stems very short, simple or subdivided, rooting and decumbent at the base, from whence arise occasional flagelliform ramuli, and also long leafy processes which are linear-clavate, flattish, and of firm texture.

Leaves very few, ovate-lanceolate, almost nerveless, entire, crowded and imbricated, so as to form the floral envelope.

Inflorescence monoicous, terminal. *Fertile flower* with the external leaves much smaller than the inner ones; *archegonia* few, with short paraphyses. *Barren flower* smaller, with fewer leaves; *antheridia* short and tumid, with short paraphyses.

Capsule solitary, on a long somewhat rigid pedicel, erect, oval-oblong, regular. *Lid* conical or obliquely rostellate. *Calyptra* submitriform, plicate as in *Tetraphis*, sometimes split on one side almost to the summit. *Peristome* as in *Tetraphis*, but shorter.

Two species of this genus are described in the *Bryologia Europæa*. Name from τετρα, *four*, and οδων, *tooth.*

3. *Tetrodontium Brownianum* Dicks., Schwaegr. (*Mr. Brown's Four-tooth-Moss*); sterile branches none; leafy processes few, linear, slightly thickened upwards; perichætial leaves ovate-acuminate, faintly nerved at the base; orifice of the capsule even. (Tab. VIII.)

Tetrodontium Brownianum *Schwaegr.* Suppl. t. 129. *Br. and Sch.* Monogr. p. 4. t. 1.
Tetraphis Browniana *Hook. and Tayl. Greville,* Scot. Cr. Fl. t. 169.
T. ovata *Funck,* Moost. t. 6. *Web. and Mohr. Hartman. Bridel.*
Bryum Brownianum *Dicks.* Crypt. Fasc. 4. t. 10. f. 16.
Orthotrichum Brownianum *Smith,* Fl. Brit.
Grimmia Browniana *Eng. Bot.* t. 1422.

Hab. Rocks, especially of gritstone and sandstone, in the north of England and Ireland. Discovered at Rosslyn, near Edinburgh, by *R. Brown, Esq.* Found in other parts of Scotland. Fr. July.

Although the structure of the fruit is that of *Tetraphis*, the habit of the plant and the structure of the leaves are totally different. There is scarcely any stem, except the floral bud may be so termed, and the long linear radical leaves (as *Bruch and Schimper* properly observe) are quite analogous to the ramuli of the other species, being formed of more than one layer of cellules, and, though flattened and sometimes bi-trifid at the summit, they are cylindrical at the base, and often grow from the scales of the decayed perichætia; they are also rooted at the base. Perichætial leaves ovate-acuminate, concave, with a faint nerve at the base, entire; areolæ oval, rather large. Fruitstalk one-third of an inch long, purplish-red. Capsule oval-oblong, olive-brown. Lid yellow, obliquely rostellate, acute, about half as long as the capsule. Calyptra reddish-brown, glossy, large, nearly covering the capsule.

Tetraphis ovata of authors is merely a state of this species, with the radical leafy processes broader and shorter, and probably often absent.

Tetraphis repanda Funck, Schwaegr. differs from *T. Browniana* in having leafy flagelliform ramuli, narrower perichætial leaves, and the orifice of the capsule notched or wavy at the interstices of the peristome. Barren specimens, corresponding with the description, have been found near Frodsham, in Cheshire, growing with *Schistostega;* but in the absence of fruit we cannot safely pronounce them to be this species.

SUBORDER XVII. BUXBAUMIEÆ.

41. BUXBAUMIA *Haller.*

Stemless, annual or biennial, growing either singly or gregarious, on soil or decaying wood; at the period of inflorescence very minute, smaller than *Phascum serratum*, partially immersed, and concealed in the soil.

Leaves very few (about six), forming the floral involucre, roundish, fringed or deeply laciniated in the upper part, nerveless, with large, oblong areolæ.

Capsule very large, on a rough thick pedicel, apophysate, oblique, flat on the upper side, convex and gibbous underneath, ovate. *Calyptra* small, covering only the lid, fugacious, cylindrico-campanulate, coriaceous, obtuse, entire, or laterally cloven at the base. *Lid* small, conical, obtuse. *Annulus* none, except the revolute margin of the mouth of the capsule. *Peristome*, according to Bruch and Schimper, double; *outer* composed of three or four layers of cellular tissue, divided into irregular or moniliform, reddish, opaque teeth; *inner peristome* a pale, whitish, conical, plicated membrane, slightly twisted when dry. *Columella* large and tumid, the upper portion falling away in union with the lid. *Sporangium* shortly pedicellate. *Spores* small, smooth. *Vaginula* ovate, fleshy.

Inflorescence dioicous. *Barren flower* gemmiform; *antheridium* solitary, subsessile, roundish; *archegonia* 3—4, with few paraphyses.

The true structure of the peristome of *Buxbaumia* has long been a subject of dispute, and the view given of it by Bruch and Schimper does not coincide with our own. After much pains bestowed in the investigation, we conclude that the so-called inner peristome is the only true peristome; for it is intimately connected with the inner layer of the tissue which constitutes the thecal membrane, and there is no proof whatever of its being a continuation of the sporangium, the structure being similar to that of *Diphyscium*. The so-called outer peristome is, therefore, to be regarded as an excrescence from the more external layers of tissue of the thecal membrane, of which we find analogous though less evident examples in *Polytrichum* and in *Orthotrichum* (e. g. *O. cupulatum*), where, however, this appendage is in a state of cohesion with the true peristome, as also in *Diphyscium*, where it is in so rudimentary a state as to be scarcely observable. Even the peristome of *Tetraphis* may be of analogous structure.

The young plants of *Buxbaumia* are similar in habit to those of *Phascum serratum*. In the form of the capsule there is a strong analogy to some exotic species of *Polytricheæ*, the connecting links being *Diphyscium* and *Dawsonia*.

Two species of *Buxbaumia* are described in the *Bryologia Europæa.* Name in honour of J. C. Buxbaum, a German botanist.

204. *Buxbaumia aphylla* Haller (*leafless Buxbaumia*); stem scarcely any, buried in the soil; lower leaves roundish, deeply toothed; upper leaves fringed with long ciliary processes; capsule plano-convex, roundish-ovate, reddish; outer peristome irregularly subdivided, thick and cellular. (TAB. XXII.)

Buxbaumia aphylla *Haller*, Enum. Meth. St. Helvet. Indig. *Linn.* Sp. Pl. &c. *Smith*, Eng. Bot. t. 1596. *Buxbaum*, Cent. Pl. t. 8. f. 2. I. G. *Web. and Mohr. Hedw. Schwaegr. Hook. and Tayl. Br. and Sch.* Monogr. p. 5. t. 1.

Saccophorum aphyllum *P. Beauv.* Æth. *Dill.* Musc. t. 68. f. 5.

Hab. In a fir wood at Sprowston, near Norwich. Near Rosslyn, *Mr. E. Maughan.* Near Aberdeen, *Mr. Jackson.* Selkirkshire, *Mr. J. Stewart.* Georgetown Hill, near Kinross, and Cleish Hills, *Prof. Arnott.* Campsie Fells, Ben Ledi, and hills near Bowling Bay, *Mr. G. J. Lyon.* Sidlaw Hills, *Mr. W. Gardiner.* Sawley Moor, Yorkshire, *Mr. W. M'Ivor.* Rare. Fr. May.

The whole plant when fully ripe is ½—1 inch in height, and resembles some species of Fungus, to which tribe it has sometimes been referred. All that can be called a stem resembles a small bulb covered with hair-like processes, which Mr. R. Brown first ascertained to be true leaves; these are inserted so far up the fleshy bulb-like vaginula, that the latter becomes what Bruch and Schimper term a *perichætial ramulus*, such as is proper to pleurocarpous mosses, and from this arises the thick, tuberculated, purplish fruitstalk, half an inch long and more, bearing at its summit a short cylindrical apophysis. Capsule pale reddish-brown, oblique, somewhat sharply bordered at the junction of the flat and convex portions, which ultimately separate into two valves for the dispersion of the sporules. The mouth of the capsule, by its tendency to become revolute, serves as an annulus, but can scarcely be considered such in its structure: it has sometimes been regarded as the outer peristome. The true outer peristome consists of a congeries of elongated cellules, in several concentric layers, very unlike the usual structure of that organ in other genera, and distinguished from the peristome of *Tetraphis* by the interposition of a conical, plicated membrane, between it and the columella. Sporangium smaller than the capsule, to the walls of which it is attached by numerous filaments, having a curved roughish pedicel at its base inserted within the apophysis. Lid narrowly conical and obtuse. Antheridia roundish, as in *Jungermanniæ.* The position of the barren flowers is somewhat dubious; according to Bruch and Schimper they are axillary, and are always found entangled amongst the tomentose covering of the vaginula along with the leaves. The fertile flowers, or rudimentary plants, have certainly a distinct origin, and are rooted in the earliest stage.

The other European species, *B. indusiata*, has the outer peristome more regularly formed of about 16 moniliform, papillose teeth, the external capsule very thin and membranous, soon peeling off, more elongated, suberect, scarcely flattened on the upper side, of a pale greenish colour, and the plant always grows on decaying wood.

42. DIPHYSCIUM *Weber and Mohr.*

Biennial or perennial? dwarfish, gregarious, growing on sterile soil in mountainous districts.

Stem short, simple, scarcely branched. *Leaves* lingulate, almost entire, nerved, spreading, flexuose, crisped when dry, thick and fleshy, but fragile; *margin* plane; *areolæ* granular and opaque. *Perichætial leaves* larger, lanceolate, tapering, erect, membranous, ciliated or lacerated in the upper part.

Inflorescence dioicous (monoicous, *Br. and Sch.*), terminal. *Barren fl.* gemmiform (according to *Br. and Sch.* on a short lateral branch at the base of the fertile stem); *antheridia* numerous, short, curved, mixed with short paraphyses. *Fertile fl.* scarcely gemmiform; *archegonia* few, with elongated styles, surrounded by numerous paraphyses, or more probably the ciliated inner perichætial leaves which serve as paraphyses.

Capsule large, subsessile, oblique, ovate, gibbous below, its walls thin and membranous. *Calyptra* conico-mitriform, entire at the base, scarcely covering the lid, which is conical and acuminate. *Annulus* small, subpersistent. *Sporangium* attached to the walls of the capsule by numerous short filaments, its short pedicel straight and fibrous. *Peristome* (double according to *Bruch and Schimper*, the *outer* one a filmy, very narrow, whitish ring, scarcely intelligible, and quite rudimentary; *inner peristome*) an elongated conical membrane with 16 plicæ, thickened at the salient angles, as though so many filiform external teeth were there united to the conical membrane, which is connected with the thecal membrane, and not with the sporangium. *Columella* large, of very lax cellular tissue, lined with the sporangial membrane, its upper portion falling away with the lid. *Spores* very small, smooth.

The close affinity of *Diphyscium* with *Buxbaumia* is sufficiently obvious. In the foliage there is some resemblance to *Polytrichum;* and in the mode of vegetation *Diphyscium* is analogous to *Phascum.* The stems do not appear to have any longer duration than is requisite for the development of the fruit, and may be only annual. The barren-flowered plants appear to be isolated, and are too seldom present to be considered as an integral portion of the fertile plant, contiguous to which they are occasionally seen. The vaginula, as in *Buxbaumia,* is of the same structure as that of pleurocarpous mosses, and the very short pedicel of the capsule appears to be organically connected with it; hence the pedicel is not easily extracted.

A second reputed species of this singular genus, found in the East Indies by the late W. Griffith, Esq., viz. *Diphyscium longifolium*, is figured and described in *Schwaegr.* Suppl. t. 325. This is said to have a dimidiate calyptra, and green spores, and grows upon moist rocks; the stems half an inch in height,—in our imperfect specimens, branched; leaves subspathulate, mucronate, denticulate, shorter and broader than in *D. foliosum*. Name from δις, *twice*, and φυσκιον, *a vesicle*, in allusion to the capsule.

05. *Diphyscium foliosum* Web. and Mohr (*leafy Buxbaumia*); stem very short; stem-leaves linear, elongated; calyptra mitriform. (Tab. VIII.)

Diphyscium foliosum *Web. and Mohr*, Bot. Tasch. p. 377. t. 11. *Hook. and Tayl. Bridel. Funck*, Moost. t. 24. f. 1. *Br. and Sch.* Monogr. p. 3. t. 2.

Buxbaumia foliosa *Linn. Hedw. Smith*, Eng. Bot. t. 329. *Schwaegr.*

Buxbaumia sessilis *Schmid.* Diss. de Buxb. p. 26. t. 1. f. 1—24. *Dill.* Musc. t. 32. f. 13.

var. β.; lower leaves acuminated; perichætial leaves with smooth bristly points.

Hab. Shady banks and barren places, in mountainous districts; sometimes on moist rocks, sometimes in company with *Polytrichum aloides*. Fr. August.

Whole plant usually less than $\frac{1}{4}$ inch in height, of which the pale capsule, in aspect and size not unlike a grain of wheat, constitutes the principal part. Leaves narrow, linear, sometimes 3 lines in length, usually about half as long, $\frac{1}{6}$ line broad, dark green, with an obscure reddish nerve ceasing below the apex, spreading, flexuose and somewhat incurved, much crisped when dry, more or less acute; margin plane, almost entire, occasionally denticulate towards the apex; they are formed of two (according to *Br. & Sch.* of several) layers of cellules, of which the uppermost (analogous perhaps to the lamelliform appendages of *Polytrichum*) is the most easily separated into lamellar fragments; but the whole of the leaf, except the nerve, is remarkably fragile. Perichætial leaves of quite different shape and structure, having a pale membranous pagina and a strong excurrent nerve, which forms a rough or serrulate bristly point, the innermost leaves remarkably divided at the top into numerous jointed cilia, supposed to serve as paraphyses in an early stage. Capsule immersed in the perichætium, pale yellowish-brown. Lid narrowly conical, acuminate. Calyptra seldom remaining until the fruit is ripe. Peristome white, slightly contorted when dry. Spores very small, pale reddish-brown. Barren flower gemmiform, terminal. Perigonial leaves dilated, ventricose and reddish at the base. Young plants are produced from the radicles, which are intermixed with the foliage.

SUBORDER XVIII. POLYTRICHEÆ.

This group of mosses is characterised by a peculiar rigid habit, and by the dilated summit of the columella, which ultimately forms the tympanum connecting the apices of the numerous short, rigid, teeth of the peristome. An exception occurs in the exotic genus *Dawsonia*, where the summit of the columella, which is not dilated, falls away with the lid, thus presenting a very marked affinity with *Buxbaumia*. In *Lyellia* also, another exotic genus, the peristome is reduced to a solid, tumid, annular contraction of the orifice of the capsule immediately surrounding the dilated apex of the columella.

In deference rather to the opinion of Bruch and Schimper, than from a conviction of the necessity for so doing, we have here followed their example in dividing *Polytrichum* into four genera. It will, however, be seen that *Pogonatum nanum* Br. and Sch. does not agree with the other species in the structure of the columella; and in *Pogonatum dendroides*, an exotic species, the calyptra is nearly naked.

43. ATRICHUM *P. Beauv. Br. and Sch.*

POLYTRICHUM *Hedw. Hook. and Tayl.* &c. (partly).

Intermediate, in habit, between *Polytrichum* and *Mnium*, gregarious, or cæspitose, the flowering stems growing from a subterraneous creeping rhizoma, with innovations from the summit. *Leaves* crowded, lanceolate, or oblong, undulated. *Capsule* cylindrical, on a long pedicel, somewhat bent, erect or cernuous. *Lid* hemispherical at the base, rostellate. *Calyptra* narrow, cucullate, spinulose at the apex, otherwise naked and smooth. Found only on soil, never upon rocks, nor upon trees.

Flowering stem erect, simple, the barren fl. plants producing innovations from the centre of the flower. *Leaves* in 5 or 8 rows; *lower ones* smaller, obliquely inserted; *upper ones* gradually larger and more crowded, lanceolate or ligulate, undulated in the margin, twisted or crisped when dry; *nerve* narrow, flattish, sparingly beset with vertical lamellæ on the upper side; *margin* thickened and cartilaginous, sharply toothed; *areolæ* dense, roundish-hexagonal.

Inflorescence monoicous or dioicous. *Barren fl.* cup-shaped, many-leaved, proliferous in the centre; *antheridia* oblong, shortly pedicellate, mixed with filiform paraphyses. *Fertile fl.* 3-leaved; *archegonia* few, slender.

Fruit. — *Capsule* on a long stalk, more or less cylindrical, straight or slightly curved, erect or cernuous. *Calyptra* narrow, cucullate, almost naked, spinulose at the apex only. *Lid* with a long slender beak, hemispherical at the base. *Annulus* none. *Peristome* single; *teeth* 32, short, ligulate, rigid, obtuse, slightly incurved, of fibrous texture, united at the base by a narrow membrane, not hygroscopic. *Sporangium* contiguous to the walls of the capsule. *Columella* cylindrical, of lax cellular texture, lined externally, as in all other mosses, by an extension of the sporangial membrane, dilated at the summit into a hemispherical crown which fills up the cavity of the peristome until the period of maturity, at length contracting into a membranous tympanum cohering to the apices of the teeth, and thus leaving the interstices free for the egress of the spores, which are small, almost smooth, olive-brown or reddish. *Vaginula* oblong-conical, membranous, and jagged at the top.

This genus (named from ἀ, ϑρὶξ, *without hairs*) resembles *Mnium undulatum* in the leaves, in the form of the flowers, and in the mode of growth by subterraneous stolons. It is distinguished from *Oligotrichum* by the softer texture of the leaves, more strongly crisped when dry; by the narrow nerve, bearing fewer lamellæ; by the cup-shaped perigonium, more naked, narrow calyptra, membranous vaginula, longer lid, more convex below, and by the sporangium, which is more closely applied to the walls of the capsule. The leaves are not sheathing at the base, as they are in *Polytrichum* Br. and Sch.

In the peculiar structure of the peristome, the *Polytricheæ* differ from all other mosses, each tooth being composed of several layers of unjointed filaments, which are traceable from the summit of one tooth to that of another, so that, in a complete separation of the component filaments of a peristome of *Polytrichum,* we obtain a shortened peristome of *Dawsonia.*

Three species of *Atrichum* are described in the *Bryologia Europæa.*

06. *Atrichum undulatum* P. Beauv. (*wavy-leaved Hair-Moss*); monoicous; upper leaves crowded, long, ligulate-lanceolate, undulated in the margin, sharply denticulate; capsule cylindrical, curved; lid with a long curved beak. (TAB. X.)

Atrichum undulatum *P. Beauv.* Ætheog. *Br. and Sch.* Monogr. p. 8. t. 1, 2.
Polytrichum undulatum *Hedw.* St. Cr. i. t. 16, 17. *Turner. Smith,* Eng. Bot. t. 1220. *Schwaegr. Hook. and Tayl.* (tab. x.)
Catharinea callibryon *Ehrh.*
C. undulata *Web. and Mohr. Röhling. Bridel.*
Bryum undulatum *Linn. Dill.* Musc. t. 46. f. 18.

var. β. attenuatum; leaves narrower, more flaccid, more crisped when dry, nerve with very narrow lamellæ; capsule more slender.

var. γ. abbreviatum; fruitstalk, capsule, and peristome shorter.

Hab. In grassy shady places, common. Var. γ. in sandy bare places. Var. *β.* from N. America, not observed in Europe. Fr. Oct., Nov.

1 or 2 inches high. Leaves ligulate, much undulated, the margin thickened, and beset with geminate spinulose teeth, the undulations also spinulose at the back, near the apex, spreading and flexuose when moist, crisped and twisted when dry, nerve with 2—6 narrow lamellæ. Barren flower terminal on the stem of the first year, which by its prolongation afterwards acquires a terminal fertile flower; perigonial leaves shorter and broader than the rest. Fruit usually solitary, sometimes in pairs. Lid nearly as long as the capsule.

Atrichum angustatum, not fully ascertained to grow in Britain, has dioicous inflorescence. Barren fl. plants, possibly belonging to this species, have been gathered near Hurst Pierpoint by Mr. Mitten. *A. tenellum* is a smaller species, also dioicous, with a short cernuous capsule and large peristome.

Polytrichum controversum of Bridel, appears to be a var. of *A. undulatum*, with wider and shorter leaves and a shorter capsule, according to specimens from Swartz, in *Herb. Arnott.*

44. OLIGOTRICHUM *De Cand.*

POLYTRICHUM *Hedw. Hook. and Tayl.* &c. (partly).

Smaller and more rigid than *Atrichum*, and less elegant; *leaves* shorter, more solid, the *nerve* broader; *barren flower* rosaceous, spreading; *lid* shorter. Growing in alpine situations.

In the mode of growth *Oligotrichum* is not different from *Atrichum.*

Leaves rather fleshy, suberect, incurved, or loosely imbricated, lanceolate, or ovate-oblong, distantly toothed or crenulate in the margin, which is not thickened, channelled; *areolæ* roundish, small; *nerve* rather broad, with numerous wavy lamellæ.

Inflorescence dioicous. *Perigonium* rosaceous or discoid; *perigonial leaves* much dilated, concave below, innermost subspathulate. *Antheridia* fusiform, curved. *Paraphyses* partly filiform, partly dilated at the apex and elongated.

Capsule erect, subcylindrical, its texture thin, slightly incurved, gibbous below.

Calyptra cucullate, with a very few erect short hairs or papillæ at the apex. *Lid* shortly rostellate. *Peristome* as in *Atrichum. Columella* distinctly lined with a plicate or winged sporangial membrane, to which it adheres by numerous short filaments. *Spores* larger than in *Atrichum*, olive-brown. *Vaginula* entire, not membranous at the summit. *Sporangium* loosely attached to the walls of the capsule.

Oligotrichum is allied to *Atrichum*, through *O. hercynicum*, and to *Pogonatum*, through several exotic species. The name (ολιγος, *few*, θριξ, *hair*) refers to the few hairs of the calyptra. Two species are given in the *Bryologia Europæa.*

207. *Oligotrichum hercynicum* De Cand. (*Hercynian Hair-Moss*); leaves erecto-patent, slightly inflexed, rigid, lanceolate from a sheathing base, concave, margin inflexed, remotely serrate, undulated near the apex, nerve covered with prominent wavy lamellæ, spinulose at the back; capsule erect, oblong; lid conical, acuminate. (TAB. X.)

Oligotrichum hercynicum *De Cand.* Flor. Gallic. *Bruch and Schimper,* Monogr. p. 4. t. 5.
Atrichum hercynicum *P. Beauv.*
Polytrichum hercynicum *Hedw.* St. Cr. i. t. 15. *Smith,* Eng. Bot. t. 1219. *Hook. and Tayl.* *Schwaegr.*
Catherinea hercynica *Ehrh.*

Hab. In alpine and subalpine situations, where the soil is barren and sloping. Common in Scotland, and on the Welsh mountains. Near Todmorden, Lancashire, *Mr. Nowell.*
Fr. June, July.

Stems $\frac{1}{2}$—1 inch high. Leaves rather rigid, but less so than in *Pogonatum* and *Polytrichum,* curved when dry, concave, the margin inflexed, not thickened, the lamellæ of the nerve much undulated. Capsule erect, ovate-cylindrical, broad and rounded at the base, when dry oblique and somewhat plicate, constricted below the mouth. Lid about half as long as the capsule. Calyptra with a very few scattered hairs, sometimes naked. Peristome short; teeth pale, irregular. Barren fl. plant slender.

Oligotrichum lævigatum, not found in Britain, has much broader leaves, and a short, ovate, curved, compressed capsule.

45. POGONATUM *P. Beauv.*

POLYTRICHUM *Hedw.* *Hook and Tayl.* &c. (partly).

More showy plants than the preceding; *stems* simple or branched, growing from a subterraneous rhizoma; *leaves* rigid, sheathing at the base, spreading above, lanceolate, the *nerve* very broad, covered with numerous crowded lamellæ; *barren flower* discoid; *capsule* oval or oblong, not angular; *calyptra* densely hairy.

Leaves in 5 or 8 rows, membranous and sheathing at the base, rigid and almost cartilaginous above; the *nerve* very broad, but not prominent, covered with many lamellæ; the *margin* more or less sharply serrated.

Inflorescence dioicous. *Barren fl.* discoid; *antheridia* slender, slightly curved; *paraphyses* either filiform or spathulate.

Fruitstalk more or less elongated. *Capsule* erect or inclined, ovate or urceolate, regular, its walls thick and firm. *Sporangium* (except in *P. nanum*) as in *Oligotrichum.* *Columella* usually 4-winged, or surrounded by a plicate sporangial membrane. *Lid* convex at the base, rostellate. *Peristome* as in the two preceding genera. *Calyptra* cucullate, covered with a dense coating of hairs attached to its apex, and reaching below the base of the capsule. *Vaginula* membranous at the summit.

Distinguished from the preceding by the hairy calyptra, and by the more rigid, densely lamellated, sheathing leaves; and from *Polytrichum* by the rounded, not angular, capsule, destitute of an apophysis. Name from *πογων*, *a beard*, in allusion to the hairy calyptra.

A. Stems not branched at the apex; columella not winged. *Nana.*

208. 1. *Pogonatum nanum* Bridel (*dwarf Hair-Moss*); stem short; leaves rigid, spreading, lanceolate from a sheathing base, minutely toothed at the apex; capsule roundish, erect or inclined, wide-mouthed when dry. (TAB. XI.)

Pogonatum nanum *Bridel,* Bryol. Univ. ii. 117. *Bruch and Sch.* Monogr. p. 5. t. 7.
Polytrichum nanum *Hedw.* St. Cr. i. t. 13. *Menzies,* in Lin. Tr. *Turner. Smith,* Eng. Bot. t. 1625. *Schwaegr. Bridel. Hook. and Tayl.*
P. pumilum *Swartz,* Musc. Suec. t. 9. f. 19. *Hedw.* Sp. Musc. t. 21.
Pogonatum pumilum *Bridel.*
Polytrichum subrotundum *Menzies. Smith,* Eng. Bot. t. 1624. *Dill.* Musc. t. 55. f. 6.

var. β. longisetum Hampe; leaves longer, linear-lanceolate; fruitstalk much elongated; capsule oval-oblong.

Hab. Sandy banks; in moist shady situations. Fr. Oct., Nov.

Stems 2—4 lines in height, never producing innovations at the top. Leaves rather obtuse, erect when dry, obscurely toothed. Capsule roundish. Lid about half as long. Peristome large. Columella cylindrical, not winged, by which mark it is readily distinguished from *P. aloides.* Calyptra reddish brown.

B. Stems with innovations at the top; columella four-winged. *Aloidea.*

209. 2. *Pogonatum aloides* Bridel (*aloe-leaved Hair-Moss*); stems short, branched above; leaves lanceolate from a sheathing base, serrated at the margin and on the back; capsule erect, oblong, cylindrico-urceolate; lid conical, acuminate; columella winged. (TAB. XI.)

Pogonatum aloides *Bridel,* Br. Univ. ii. 119. *Bruch and Schimp.* Monogr. p. 6. t. 8.
Polytrichum aloides *Hedw.* St. Cr. i. t. 14. *Menzies. Turner. Smith,* Eng. Bot. t. 1614. *Schwaegr. Hook. and Taylor. Dill.* Musc. t. 55. f. 7.
P. rubellum *Menzies. Smith,* Eng. Bot. t. 1939. *Turner. Dill.* Musc. t. 55. f. 5.
P. pulverulentum *Hedwig. Schwaegr. Bridel* (perhaps not of *P. Beauv.*).

var. β. minus; stem and fruitstalk short; hairs of the calyptra confluent below the capsule.

Polytrichum Dicksoni *Turner*, Musc. Hib. p. 90. t. 10. f. 2. *Eng. Bot.* t. 1605.

Hab. Moist banks. Var. β. found with the typical form in various parts of England, Scotland, and Ireland.

Fr. Oct., Nov.

Stems ¼—1 inch in height, occasionally branched and dichotomous. Leaves rigid, spreading, erect when dry. Capsule pale, longer than in the preceding species, ovate-oblong. Lid conico-rostellate. Calyptra covered with whitish hairs. Peristome shorter than in *P. nanum.* Columella 4-winged. Spores greenish.

P. rubellum Menzies, is a variety with taller stems and longer setæ than usual.

C. Stems branched above; capsule subcylindrical or ovate, erect or slightly curved. *Urnigera.*

10. 3. *Pogonatum urnigerum* Bridel (*urn-fruited Hair-Moss*); leaves with short sheathing bases, spreading, lanceolate, acute, serrated; capsule erect, subcylindrical, regular, granulated on the surface; lid convex, rostrate. (TAB. XI.)

Pogonatum urnigerum *Bridel,* Br. Univ. i. 124. *Br. and Sch.* Monogr. p. 8. t. 9.

Polytrichum urnigerum *Lin. Hedw.* Sp. Musc. t. 22. f. 5—7. *Schwaegr. Menzies. Turner. Smith,* Eng. Bot. t. 1218. *Hook. and Tayl.*

var. β. crassum; leaves broader, straight; capsule more tumid, oval-oblong; lid convex, apiculate.

Hab. On banks and sides of streams, principally in mountainous countries. Fr. Oct., Nov.

Growing in lax, pale, glaucous-green patches. Stems 1—4 inches high, branched and sub-fastigiate above, reddish below. Fertile innovations from the side of the perichætium; barren-flowered innovations from the centre of the barren flower, as in other members of this family. Leaves spreading from a short, sheathing base, erect when dry, linear-lanceolate, plane above, acute, glaucous-green, lower ones reddish, lamellæ suddenly thickened at the edges. Capsule of firm texture, reddish-brown, papillose or granular, narrower and paler than in the next species; lid shorter. Calyptra longer.

This species may in general be known by the glaucous, reddish hue of the foliage, and by the neat cylindrical capsules.

P. capillare Michaux, as represented by Sullivant's specimens, (*Musc. Alleghan.* 115.) has shorter capsules, and longer teeth without a distinct basilar membrane; but Bridel's description seems to refer to a different moss. Swartz's *P. capillare* is different from all: it has short stems, and narrower and longer leaves than *P. urnigerum*, and may be a distinct species.

11. 4. *Pogonatum alpinum* Bridel (*alpine Hair-Moss*); leaves elongated, linear-lanceolate, sheathing at the base, concave,

sharply serrated, spinulose at the back ; capsule erect, or inclined, roundish-ovate, or oval-oblong, smooth ; lid with a long beak ; teeth of the peristome short and narrow. (TAB. XI.)

Pogonatum alpinum *Bridel*, Bryol. Univ. ii. p. 129. *Br. and Schimp.* Monogr. p. 9. t. 10.

Polytrichum alpinum *Lin.* *Menzies*, in Lin. Tr. *Hedw.* Sp. Musc. t. 19. *Turner.* *Smith*, Eng. Bot. t. 1905. *Schwaegr.* *Hook. and Tayl.*, &c. *Dill.* Musc. t. 55. f. 4.

var. β. arcticum ; capsule oblong, subcylindrical.

Polytrichum arcticum *Swartz*, Musc. Suec. t. 8. f. 17.

var. δ. campanulatum ; stem short, with fastigiate branches ; leaves narrower and shorter ; capsule (with an apophysis, *Hornsh.*) roundish-ovate ; calyptra whitish, campanulate.

Polytrichum campanulatum *Hornsch.* Fl. Berol. *Bridel.*

Hab. In subalpine regions in England, Scotland, Ireland, and Wales. Fr. June.

Stems usually longer than in the preceding, decumbent at the base, or incurved. Leaves longer, spreading and recurved, of a darker, duller green, suberect when dry, the margin inflexed, lamellæ less suddenly thickened at the edges. Fruitstalk thicker, yellowish. Capsule more tumid, roundish, dark olive-brown, blackish when old, smooth, the walls thin. Lid nearly as long as the capsule. Calyptra deep reddish-brown. Peristome short, pale ; the teeth narrow, smaller, and less regular than in the preceding.

46. POLYTRICHUM *Bridel.*

POLYTRICHUM *Hook. and Tayl.* (partly).

Capsule angular, with a discoid apophysis, at first erect, when ripe horizontal. *Lid* convex at the base, rostrate, the beak variable in length, straight or oblique. *Peristome* of 64 (rarely 32) teeth, of the same structure as in *Pogonatum.* *Calyptra* very hairy, the hairs covering the whole capsule, whitish or reddish-brown. *Sporangium* much plicated, the inner or columellar portion 4—6 winged. *Diaphragm* as in *Pogonatum.* *Spores* small, olive-brown.

Stems erect, growing from a subterraneous rhizoma, firm, triangular, dark-purple, shining, beset with radicles at the base only, simple, rarely dichotomous. *Barren-flowered stems* with annual innovations from the centre of the flower ; *fertile-flowered innovations* arising from the rhizoma.

Leaves horizontally inserted (disp. $\frac{2}{5}$, $\frac{3}{8}$, or $\frac{5}{13}$) ; *lower ones* minute, lanceolate, membranaceous, appressed to the stem, *upper leaves* sheathing, membranaceous, and reddish at the base, more or less spreading in the upper part ; the *nerve* dilated above, and covered with numerous straight lamellæ, either ceasing at the apex of the leaf, or prolonged into a bristly point ; the *margin* of the leaf either incurved and entire, or plane and sharply serrated; *areolation* dense. *Inflorescence* dioicous, as in *Pogonatum.*

Growing in dry or moist uncultivated places, especially in turbaries, heaths, and woods. Perennial.

The species of the genus *Polytrichum,* as above defined, are among the tallest and most showy of the family. They are distinguished from *Pogonatum* by the prismatic apophysate capsule; and the peristome, with few exceptions, has twice the number of teeth. The subterraneous rhizoma, also, is nearly erect; hence the tufts are more compact. The stems are of almost woody texture. The villous covering of the calyptra is developed very soon after the fecundation of the archegonium, and has its origin principally from the apex, though some of the hairs are attached to the base of the archegonium, which afterwards constitutes the vaginula. These hairs are of different structure from the true paraphyses, which are intermixed with the archegonia, and are visible at an earlier period. The true structure of the sporangium and of the columella of mosses may be most easily learned by careful examination of the unripe capsules of the various species of this genus, where it will be seen that the columella or most central mass of tissue is separated from the spores by the inner portion of the sporangium. The diaphragm which is attached to the peristome constitutes the dilated apex of the columella, the lid being filled up with cellular tissue, which seems to have a distinct origin. The peristome, as in other mosses, is a continuation of the inner layers of tissue composing the theca, but there are traces in some species of an inner peristome (united with the outer teeth into one mass) proceeding from the sporangial membrane. Name from πολυς, *many*, and ϑριξ, *hair;* from the hairy calyptra.

SECT. I. *Capsule with six angles; apophysis less distinct.* SEXANGULARIA.

A. Leaves rather short, margin incurved, rather broad, membranous, entire.

12. 1. *Polytrichum sexangulare* Hoppe (*northern Hair-Moss*); leaves spreading, incurved, rigid, linear-lanceolate, concave, margin inflexed, entire; capsule ovate, 4—6-angled, on a thick pedicel; calyptra rather short; lid rostrate; peristome short. (TAB. X.)

Polytrichum sexangulare *Hoppe*, Bot. Tasch. 1800, p. 150. *Swartz,* in Schrad. Journ. *Eng. Bot.* t. 1906. *Bridel. Web. and Mohr. Sturm. Br. and Sch.* Monogr. p. 7. t. 11.

P. septentrionale *Swartz*, Musc. Suec. t. 9. f. 18. (Herb. Turner.) *Menzies,* in Lin. Tr. v. 4. t. 7. f. 5. *Schwaegr.* Suppl. *Hook. and Tayl.*

P. norvegicum *Hedw.* Sp. M. t. 22. (fide *Swartz.*)
P. helveticum *Schleicher.*
P. crassisetum *Decand.* Fl. Franc.

Hab. Highest summit of Ben Nevis, Scotland: also on Ben Lawers, barren; Ben-mac-duich, Brae Riach, Ben-na-Bourd, and on other mountains of the Cairngorum range, in fruit. Fr. Aug., Sept.

Stems suberect, when barren 2—6 inches long, fertile ones shorter. Leaves linear-lanceolate from a broad sheathing base, often subsecund, and when dry almost falcate, entire, except at the apex, where they are slightly toothed, obtuse, convex and smooth behind, so as to be semi-cylindrical, their margins inflexed; lower leaves reddish, upper ones bright green, shining. Fruitstalk an inch long or more, thick and succulent, reddish. Capsule at length cernuous or horizontal, ovate, with an obscure apophysis, and usually with five or six angles, pale brown, blackish when old. Lid about half as long as the capsule. Villous covering of calyptra shorter than the capsule, brownish. Teeth of the peristome 64, pale.

P. septentrionale Swartz, certainly belongs to this species. It is considered by *Bruch and Schimper* to be a variety of *Pogonatum alpinum.* (See also *Bridel*, Bryol. Univ.)

B. Leaves longer, plane, sharply serrated.

213. 2. *Polytrichum gracile* Menzies (*slender Hair-Moss*); stems densely tufted; leaves short, their margins pale, lanceolate from a sheathing base, rather broad, serrated; capsule ovate, obscurely angular; teeth of the peristome irregular, with a very indistinct basilar membrane; lid rostrate; calyptra shorter than the capsule. (TAB. XLVI.)

Polytrichum gracile *Menzies*, in Lin. Trans. v. 4. t. 6. f. 3. *Turner. Eng. Bot.* t. 1827. *Schwaegr.* Suppl. t. 148. *Web. and Mohr. Bridel. Br. and Sch.* Monogr. p. 10. t. 13.
P. longisetum *Swartz.* Musc. Suec. t. 8. f. 16. *Funck,* Deutsch. Moose, t. 56. f. 11.
P. aurantiacum *Hoppe.*

Hab. In turbaries, &c; frequent. Fr. June.

Similar to the next species, but usually smaller and more slender, the stems more densely tufted. Leaves shorter, tapering from the sheathing base, the margin broader and pellucid, lamellæ more prominent, areolæ larger. Capsule shorter, ovate, the angles 4—6, very obtuse and indistinct, the mouth narrower, and the apophysis less evident. Calyptra smaller, not covering the whole capsule, pale. Lid with a longer beak. Teeth of the peristome sometimes 32, sometimes 64, the basilar membrane not rising above the mouth of the capsule. Spores larger. From *P. commune* this species is known by the ovate, almost round, obscurely apophysate capsules, by the pale, small calyptra, and by the absence of distinct perichætial leaves.

214. 3. *Polytrichum formosum* Hedw. (*buff-fruited Hair-Moss*);

stem elongated, simple; leaves spreading, linear-lanceolate from a sheathing base, acute, sharply serrated, plane; capsule 4—6-angled, pale brown, obscurely apophysate; lid conico-rostrate; calyptra large. (Tab. XLVI.)

Polytrichum formosum *Hedw.* Sp. M. t. 19. *Schwaegr.* Suppl. *Web. and Mohr. Bridel. Br. and Sch.* Mongr. p. 9. t. 12.

P. attenuatum *Menzies,* in Lin. Trans. v. 4. t. 6. f. 2. *Turner. Smith,* Eng. Bot. t. 1198.

P. commune *β.* attenuatum *Hook. and Tayl.*

var. β. pallidisetum; stem shorter; leaves shorter; capsule narrower, on a shorter yellowish fruitstalk.

P. pallidisetum *Funck,* Deutsch. Moose, t. 56. f. 10.

Hab. In woods, &c. Fr. June.

Stems 3—6 inches long, growing in loose tufts, seldom branched. Leaves spreading, recurved, when dry suberect, long, linear-lanceolate, very acute, plane above, convex at the back, sharply serrate, lamellæ slightly thickened in the margin. Fruitstalk pale fawn-coloured or yellowish, rather thick. Capsule oblong, at first erect, subsequently horizontal, with 4—6 angles, pale brown or fawn-coloured, of thin soft texture, with an obscure apophysis. Lid half as long as the capsule or longer, rostrate. Calyptra covering the whole or greater part of the capsule. Teeth of the peristome 64, rather short, pale, the basilar membrane very narrow, scarcely rising above the mouth of the capsule.

This species has often been confounded with *P. commune*, from which it is easily known by its soft, pale fawn-coloured capsule, which has often 5 or 6 angles; by the more obscure apophysis; by the longer, conical, rostrate lid; by the deeper green colour of the foliage; and by the absence of distinct perichætial leaves: it is indeed much more closely allied to the preceding species.

Sect. II. *Capsule with four angles; apophysis very distinct.* Quadrangularia.

A. Leaves plane, serrated; nerve broad, occupying nearly the whole width of the leaf.

4. *Polytrichum commune* Linn. (*common Hair-Moss*); stems simple, elongated; leaves widely spreading and recurved, linear-lanceolate from a pale sheathing membranous base, serrated, lamellæ bifid at the edges; perichætial leaves longer, membranaceous, cirrhoso-piliferous; capsule acutely 4-angled, short, distinctly apophysate; lid conico-rostellate; calyptra large. (Tab. X.)

Polytrichum commune *Linn.* Sp. Pl. 1573. *Hedwig. Menzies,* in Lin. Tr. *Turner. Smith,* Eng. Bot. t. 1197. *Schwaegr. Bridel. Funck,* Deutsch. M. t. 55. n. 7. *Hook. and Tayl. Röhling. Br. and Sch.* Monogr. p. 13. t. 17.

P. yuccæfolium *Dill.* Musc. t. 54. f. 1. *Ehrh. Web. and Mohr.*
var. β. perigoniale ; smaller ; outer perichætial leaves longer.
P. perigoniale *Michaux. Bridel.*
var. γ. minus ; stem short, occasionally branched ; leaves shorter, more crowded, less spreading ; perichætial leaves less evident ; fruitstalk shorter ; capsule smaller, less acutely angular ; calyptra paler and shorter.
P. commune var. minus *Swartz. Bruch and Schimper.*
P. perigoniale *Funck,* Deutsch. M. t. 55. n. 8.
var. γβ. fastigiatum ; stems branched, fastigiate, densely tufted ; leaves, capsule, &c., as in var. γ.
P. fastigiatum *Lyle MSS.*

Hab. In marshy and turfy places ; var. β. on heaths in drier situations ; var. γ. on dry heaths ; var. γβ. on the drier parts of moors in mountainous districts. Near Airth, Scotland, *Mr. T. Lyle.* Fr. June.

Growing in broad green patches; in the var. γβ. densely tufted. Stems from 6 inches to a foot long or more (about 2 inches long in var. γ.), erect, simple, tomentous at the base, more or less branched in var. γβ. Leaves suddenly dilated and closely sheathing at the base, which is white, membranous, and shining in the typical form, thence widely spreading and recurved, linear-lanceolate, long, distant, when dry erect and somewhat twisted, very acute, sharply serrated on the margin and at the back; lamellæ bifid at the edges, covering nearly the whole width of the leaf. Perichætial leaves large, membranous, terminating in long wavy hair-points, straight in the var. γ. Fruitstalk reddish, 2—3 inches long. Capsule sharply quadrangular, short, reddish-brown, at length cernuous and horizontal, roughish, the apophysis very distinct, turbinate. Lid variable in the typical form, conico-rostellate, and nearly half as long as the capsule; the border purplish, as correctly described by Bridel; in other cases convex or flattish with a shorter beak. Teeth of the peristome 64, rather short, the basilar membrane reddish. Calyptra large, of a rich fulvous colour, inclining to red. Spores very small, yellow or greenish.

From the two preceding species *P. commune* may always be known by the distinct perichætial leaves, as well as by the distinctly apophysate sharply quandrangular capsules; the calyptra, also, is larger and more deeply coloured. *P. commune var. fastigiatum* differs so remarkably from the ordinary type in the branched densely tufted stems, crowded suberect leaves, small neat capsule, short lid, and pale calyptra, that we were at first disposed to regard it as a distinct species: it appears to constitute with the var. γ. a permanent variety, differing from the typical form, not only by the assigned characters, but by the uniform yellow or orange-coloured lid, not purplish at the border, and by the smaller, paler teeth of the peristome, without any evident basilar membrane. The stems are more or less branched (in some barren specimens with 12 or more branches on each stem), whereas the ordinary form of *P. commune* is rarely found with two branches, as mentioned by Dillenius. If the var. γ. be indeed a different species, it must have been often confounded with *commune*, which is described by Schwaegrichen and by Bruch and Schimper as having a shorter lid than is proper to the species. Indeed the figure given in the *Bryologia Europæa* is not very characteristic, especially as to the foliage and lid.

B. Leaves bristle-pointed, with entire, inflexed, broad margins.

5. *Polytrichum juniperinum* Hedw. (*juniper-leaved Hair-Moss*); stem simple or branched; leaves spreading, recurved, linear-lanceolate from a sheathing base, shortly aristate, margin closely inflexed, entire; capsule acutely quadrangular; lid shortly rostellate. (Tab. X.)

Polytrichum juniperinum *Hedw.* Sp. Musc. t. 18. *Willden. Turner. Smith. Menzies,* in Lin. Tr. vol. 4. t. 6. f. 4. *Eng. Bot.* t. 1200. *Funck,* Deutsch. M. t. 54. B. f. 1. *Schwaegr. Röhling. Web. and Mohr. Bridel. Hook. and Taylor. Br. and Sch.* Monogr. p. 12. t. 15, 16.

P. juniperifolium *Hoffm. Dill.* Musc. t. 54. f. 2.

var. β. *strictum*; stem slender; leaves erecto-patent, straight; capsule almost cubical.

P. strictum *Menzies,* in Lin. Tr. v. 4. t. 7. f. 1. *Turner. Eng. Bot.* t. 2435. *Bridel.*

var. γ. *alpestre*; stems densely tufted and tomentous below; leaves suberect, shorter; capsule cubical.

P. alpestre *Hoppe. Sturm. Schwaegr.* Suppl. t. 97. *Funck,* l. c. t. 54. B. f. 2.

Hab. On heaths. β. in turfy or marshy situations. γ. in more alpine situations. Fr. May, June.

Stems 1—6 inches long, growing in dense, somewhat glaucous-green patches, simple or dichotomously branched, rigid. Leaves more or less recurved, very acute, obscurely bristle-pointed; the margins entire, closely inflexed, so as almost to cover the lamellated portion of the leaf; the back more or less spinulose. Perichætial leaves membranaceous, erect. Fruitstalk 2—3 inches long. Capsule horizontal when dry, acutely quadrangular, roughish, brown; apophysis distinct, purplish. Calyptra large, reddish-brown. Teeth of the peristome 64, pale, rather short, the basilar membrane very narrow.

This species varies considerably in the length and direction of the leaves, and even in the mode of innovation, according to the locality in which it grows. *P. affine* of Funck, *Deutsch Moose,* t. 54. B. f. 3. belongs to one or other of the varieties above named.

7. 6. *Polytrichum piliferum* Schreb. (*bristle-pointed Hair-Moss*); loosely cæspitose; stem simple; leaves lanceolate from a sheathing base, suddenly larger towards the top of the stem, crowded into a dense tuft, suberect, bluntish, piliferous, margin inflexed, entire; capsule ovate, quadrangular, distinctly apophysate. (Tab. X.)

Polytrichum piliferum *Schreb.* Fl. Lips. p. 74. *Hedw. Menzies. Turner. Smith,* Eng. Bot. t. 1199. *Schwaegr. Funck,* l. c. t. 54. B. f. 5. *Hook. and Tayl. Bridel. Hoppe. Br. and Sch.* Monogr. p. 11. t. 14.

P. commune γ. pilosum *Linn.* *Dill.* Musc. t. 54. f. 3.
P. Hoppii *Hornsch.* *Bridel.*

Hab. On dry heaths. Fr. May, June.

Stems loosely tufted, about 1 inch in height, the lower half bearing very small, appressed, inconspicuous leaves; upper leaves larger and crowded, erecto-patent, suberect when dry, shorter and more obtuse than in the preceding species, the hair-points longer. Perichætial leaves more distinctly membranous. Capsule with less acute angles, cernuous when ripe. Teeth of the peristome 64, pale, the basilar membrane more distinct. Calyptra longer, reddish, more deeply coloured than in the preceding. Perigonia of a redder tint.

This is easily distinguished from *P. juniperinum* by the leaves abruptly terminating in a rough hairy point. *P. Hoppii* is an alpine state of the species, with shorter, thicker capsules, more robust fruit-stalks, and larger leaves.

SUBORDER XIX. BRYEÆ.

47. TIMMIA *Hedwig.*

Perennial mosses, approaching to *Polytrichum* in habit, and to *Mnium* in the form of the capsule.

Stems cæspitose, decumbent at the base, elongated, radiculose below, with innovations from near the summit.

Leaves in eight rows (disp. $\frac{5}{8}$), sheathing at the base, as in *Polytrichum*, lanceolate and spreading above, when dry falcato-incurved, and somewhat twisted, coarsely serrated, nerved to the apex; *areolæ* small and roundish above, oblong towards the base.

Inflorescence monoicous. *Barren flowers* axillary among the upper leaves, gemmiform, sessile or shortly pedicellate; *antheridia* subcylindrical, on long thick pedicels; *archegonia* with long styles; *paraphyses* filiform.

Fruit terminal, mostly solitary. *Capsule* ovate, or subpyriform, tapering and subapophysate at the base, similar in form and size to that of *Mnium*, horizontal, rarely inclined, often suberect, of thick texture. *Annulus* compound, spirally unrolling. *Lid* convex, mammillate or with a central depression. *Calyptra* cuculliform, rather large, sometimes persistent till th fruit is ripe. *Peristome* double; *outer teeth* 16, as in *Mnium* when dry inflexed and geniculate; *inner*, a transparent membrane divided more than half-way into numerous (about 64 filiform cilia, at first united or anastomosing near the apex, subsequently free. *Spores* very small.

The genus *Timmia* seems to be an intermediate link, connecting *Mnium* with *Aulacomnion*, approaching the latter i the leaves and inflorescence, differing from all others of th family in the structure of the inner peristome.

Two species are described in the *Bryologia Europæa.* Name in honour of J. C. Timm, a German, author of a *Flora Megapolitana.*

Timmia austriaca Hedw. (*sheath-leaved Timmia*); stems elongated; leaves linear-lanceolate, dilated and sheathing at the base, coarsely toothed; capsule pyriform-oval, striated; lid mammillate; cilia of the inner peristome smooth and entire. (Tab. XXXVI.)

Timmia austriaca *Hedw.* Sp. M. t. 42. f. 1—7. *Schwaegr. Funck,* Deutsch. Moose, t. 28. f. 2. *Wahlenb. Hessler,* Comment. de Timmia, p. 21. f. 4. *Bridel. Br. and Schimp.* Monogr. p. 7. t. 2.
T. megapolitana *Hook. and Tayl.* (not *Hedw.*) omitting the figure.

Hab. Exceedingly rare, on rocks on the banks of the Isla, above Airly Castle, Forfarshire. Discovered by *Mr. Thos. Drummond* in 1824, but without fruit. Fr. Summer.

T. austriaca grows in dense tufts 3 or 4 inches high, slightly branched, foliage reddish-brown below; it is a larger, more robust species than *T. megapolitana*, and is well characterised by the coloured, distinctly sheathing bases of the leaves, which are less crowded, straighter, more distinctly toothed, and somewhat glossy. Capsule striated or furrowed when dry. Fruitstalk nearly 2 inches long. Lid always apiculate. Teeth of the peristome longer, cilia not appendiculate. Antheridia longer, on a shorter pedicel. In *T. megapolitana* the leaves are more crowded, not distinctly sheathing at the base, the capsule smooth, and the cilia of the inner peristome are distinctly appendiculate, as in most of the species of *Bryum. Timmia cucullata* of Michaux is only an accidental state of *T. megapolitana* with the calyptra attached to the summit of the fruitstalk, the lateral fissure not having extended to the base.

48. AULACOMNION *Schwaegr.*

Aulacomnion, Gymnocephalus, Arrhenopterum *Schwaegr.*
Bryum, Mnium, Arrhenopterum *Hedw.*
Bryum *Hook. and Tayl.*

Perennial mosses, growing chiefly in marshy places, sometimes upon stones, allied to *Mnium*, to *Bartramia*, and to *Meesia*, but of peculiar habit, with striated, oblong, cernuous capsule, and the lid obtusely rostellate.

Stem erect, tomentous with radicles, more or less branched, the ramuli frequently flagelliform, bearing terminal globular masses (*pseudopodia* of Bridel) of rudimentary leaves or gemmæ.

Leaves in 5—8 rows, elongated, linear-lanceolate, oval, or obovate, semi-amplexicaul at the base, concave or almost plane and carinate, entire or denticulate, often papillose; *areolæ* roundish; *nerve* ceasing below the apex.

Inflorescence mostly dioicous, monoicous in one species (*Arrhenopterum*). *Barren flower* either terminal or axillary, discoid or gemmiform; *antheridia* oblong, shortly pedicellate; the *paraphyses* longer, clavate or filiform. *Fertile flower* gemmiform, terminal; *archegonia* 10—20, with or without filiform paraphyses.

Fruit solitary, terminal. *Fruitstalk* elongated, flexuose. *Capsule* cernuous, oval or oblong, regular or incurved, striated, furrowed when dry; *apophysis* or *neck* short, tapering into the fruitstalk. *Annulus* compound, dehiscent. *Calyptra* rather small, cucullate, smooth. *Lid* convex at the base, shortly and obtusely rostellate. *Peristome* double; *outer teeth* 16, equidistant, one third of the length of the capsule, lanceolate-subulate, hygroscopic, incurved when dry, trabeculated internally; the *transverse bars* or *articulations* narrow and crowded; *inner peristome* a very thin pellucid membrane divided half-way into 16 carinate lacunose processes, with interposed cilia, two or three together. *Spores* very small, round, smooth.

It is not easy to decide whether the American *Arrhenopterum heterostichum* should rank in this genus. Apart from the inflorescence, there is the closest affinity between that moss and *Aulacomnion turgidum*, some varieties of which can scarcely be distinguished from *A. palustre:* on the other hand, the genus, as at present constructed, exhibits greater discordance in one of its more important features than is found in any other genus.

Three European species are described in the *Bryologia Europæa.* Name from αυλαξ, ακος, *a furrow*, and μνιον, *moss;* in allusion to the furrowed capsule.

a. Barren flower discoid.

217. 1. *Aulacomnion palustre* Schwaegr. (*marsh Thread-Moss*); dioicous; barren flower discoid; stem branched; leaves oblong-lanceolate, erecto-patent, flexuose, twisted when dry, papillose, denticulate at the apex; capsule oval, incurved, lid conical. (TAB. XXVIII.)

Aulacomnion palustre *Schwaegr.* Suppl. t. 226. *Br. and Sch.* Monogr. p. 9. t. 3. (Gymnocephalus palustris *Schwaegr.*)

Mnium palustre *Hedw. Bridel.*

Bryum palustre *Swartz. Eng. Bot.* t. 391. *Turner. Hook. and Tayl. Dill.* Musc. t. 31. f. 3, 4, 8.

Hypnum elodes *Web. and Mohr.*

var. β. imbricatum; leaves broader, imbricated, entire, not twisted when dry.

var. γ. fasciculare; stems much branched, innovations short; leaves fasciculate; ramuli flagelliform, growing from the axillæ of the floral leaves.

Mnium fasciculare *Bridel,* Bryol. Univ. ii. 733.

var. δ. polycephalum ; stem decumbent, branched ; pseudopodia elongated, numerous.

Mnium polycephalum *Bridel,* 2. p. 10. *Dillen.* l. c.

Hab. In turfy bogs and marshes. Fr. May, June.

Stems 2—4 inches long, cæspitose, branched, beset almost to the summit with reddish radicles ; innovations subfastigiate, from the base of the flower ; branches slender, often terminating in pseudopodia. Leaves in 8 rows, crowded, more or less spreading, flexuose, twisted or crisped when dry, oblong-lanceolate, carinate, slightly undulated, papillose on both sides, margin reflexed, apex denticulate, areolæ roundish or dot-like, nerve ceasing below the apex. Barren flower terminal, discoid. Fruitstalk 1 inch long, solitary, reddish. Capsule slightly bent and cernuous, ovate-oblong, gibbous at the back, shortly apophysate, at length horizontal, reddish-brown, furrowed. Lid short, conical at the base, very shortly and bluntly rostellate. Annulus compound. Peristome large, outer teeth yellowish-brown ; inner peristome with 2—3 cilia between each pair of principal segments, which are cloven along the keel nearly to the summit.

The pseudopodia are of much rarer occurrence in this species than in the following, and seem to depend on the excessive degree of heat and moisture of the locality, being formed at the expense of the fruit, which is then abortive. The capituli consist of masses of rudimentary leaves resembling gemmæ.

b. Barren flower gemmiform.

2a. 2. *Aulacomnion androgynum* Schwaegr. (*bud-headed Thread-Moss*); dioicous; barren flower terminal, gemmiform; stem nearly simple ; leaves oblong-lanceolate, shorter and narrower than in the preceding, denticulate at the apex ; capsule oblong, regular, cernuous ; lid conical. (TAB. XXVIII.)

Aulacomnion androgynum *Schwaegr.* Suppl. t. 125. *Br. and Sch.* Monogr. p. 11. t. 4.

Bryum androgynum *Hedwig,* Fund. Musc. t. 5. f. 35, 36. *Turner. Hook. and Tayl.*

Mnium androgynum *Lin. Smith,* Eng. Bot. t. 1328.

Gymnocephalus androgynus *Schwaegr. Funck,* Deutsch. Moose, t. 28. f. 1. *Dill.* Musc. t. 31. f. 1.

Hab. In woods and on banks, in shady dry situations, never in marshes ; very rare in fruit. Abbey wood near Erith, Kent, in fruit, 1843, *Mr. Mitten.* On an old wall below Dunmore Tower, near Airth, by Falkirk, *Mr. Thos. Lyle.*
Fr. May, June.

Barren tufts compact; fertile ones more lax, yellowish-green. Stems smaller than in the preceding, scarcely 1 inch long, innovations usually two together. Lower leaves lanceolate, upper ones elongated, forming a terminal cluster, more or less spreading, straight, not flexuose, scarcely crisped when dry, papillose, margin recurved, apex serrate. Fruitstalk scarcely an inch long, red. Capsule more or less inclined, subcylindrical, shortly apophysate, furrowed, reddish-brown, slightly constricted below the mouth. Lid shorter than in the preceding, conical. Annulus compound. Peristome as in the last.

The pseudopodia are always very abundant in this species, and they occur even in the same tuft which produces fertile plants, in Mr. Mitten's excellent specimens. The stems which produce them are always more branched, and have frequently an abortive fertile flower. The capituli consist of clusters of fusiform, shortly pedicellate, granular bodies, resembling gemmæ, and are very fugacious.

This species is almost a miniature resemblance of the preceding, distinguished by its gemmiform barren flower, by the regularly formed capsule, and by the structure of the pseudopodia. It is also not very unlike *Ceratodon purpureus* in size and general aspect. The rarity of the fruit appears to be owing to the general absence of barren-flowered plants, which are certainly very seldom visible.

49. ORTHODONTIUM *Schwaegr.*

Delicate slender mosses, with terminal fruit, in habit resembling the narrow-leaved species of *Bryum*, growing in tufts, with almost setaceous lerves, clavate cernuous capsules, and shortly rostellate lid. Perennial, growing on rocks.

Stems with innovations from the floral apex, repeatedly dichotomous, fastigiate, slender, fragile, rooting at the base.

Leaves in eight rows, crowded, more or less spreading, linear-lanceolate, or almost setaceous, very narrow, loosely cellular; *areolæ* oblong; *margin* plane, nearly entire; *nerve* ceasing near the apex.

Inflorescence monoicous. *Antheridia* either axillary among the terminal leaves, or contained in an axillary gemmiform flower; *archegonia* few together; both organs mixed with filiform paraphyses.

Capsule on a slender fruitstalk, more or less inclined, clavate, with a tapering neck or apophysis, symmetrical, of thin texture, with lax cellules. *Calyptra* small, cuculliform, fugacious. *Lid* conical, shortly rostellate. *Annulus* rudimentary. *Peristome* double, inserted below the mouth of the capsule; *outer teeth* 16, lanceolate-subulate, without a medial line, in other respects as in *Bryum*, erect when moist, incurved and concealed within the mouth of the capsule when dry; *inner peristome* a membrane divided almost to the base into 16 short, narrow, almost filiform processes, which are slightly carinate. *Spores* of medium size.

This genus, of which there are two or three exotic species, but only one of European growth, is closely allied to *Bryum* through the subgenus *Pohlia*. There is also some resemblance in the foliage and mode of ramification to the *Dicraneæ*, through *Dicranum polycarpum* and its allies. In the structure of the inner peristome there is some analogy with that of *Orthotrichum*. Name from ορθος, *straight*, and οδων, *tooth*.

221. *Orthodontium gracile* Schwaegr. (*slender Thread-Moss*); stems short, tufted; leaves crowded, linear-setaceous, spreading,

flexuose, subcarinate, entire, nerved nearly to the summit; capsule inclined, narrowly clavate, with a long tapering apophysis; lid rostellate; antheridia axillary. (TAB. XLVII.)

Orthodontium gracile *Schwaegr.* in lit. *Br. and Sch.* Monogr. p. 4. t. 1.

Bryum gracile *Wilson,* in Suppl. Eng. Flor. t. 2835.

Hab. On sandstone rocks; at Helsby and Frodsham, Cheshire, March, 1833; and upon Alderley Edge, Cheshire, *W. Wilson.* Wharfedale, Yorkshire, *Mr. Spruce.* Fr. March.

Stems very slender, fragile, tufted, seldom more than ½ an inch long; but in a barren state they have been seen 2 inches high; branched. Leaves more or less spreading, crowded, somewhat crisped when dry, very slender, carinate; the margin often undulated, slightly recurved near the base; nerve faint, gradually disappearing near the summit; cellules lax, oblong. Fruitstalk about ½ an inch long, pale red, very slender, slightly curved, sometimes though very rarely two together. Capsule inclined, oblong-pyriform, gradually tapering at the base into the fruitstalk, pale yellowish-brown, its texture thin and almost transparent. Lid about one third of the length of the capsule, the rudimentary annulus adhering to its border. Outer teeth pale, strongly inflexed when dry, nearly twice as long as the narrow processes of the inner peristome. Calyptra small, covering very little more than the lid. Spores reddish, rather small. Antheridia numerous, in the axillæ of the upper leaves.

The young capsules of this moss have at first a considerable vacancy between the sporangium and the outer wall of the theca, the sporangium itself being of less diameter and somewhat shorter than the cellular pedicel which partially fills the apophysis. The inflorescence is analogous to that of *Bryum nutans.* This moss is known only as a native of Britain and of Abyssinia. One Australian species, *O. sulcatum* Hook. and Wils., has striated capsules.

50. LEPTOBRYUM.

BRYUM *Hook. and Tayl., &c.*

This genus seems to require a separate place, apart from *Bryum,* on account of its different mode of growth, the stems being of only annual duration, not producing innovations from the apex like the true species of *Bryum;* a fresh growth of stems being produced annually.

Leaves very narrow, almost setaceous. *Inflorescence* synoicous. *Capsule* and *peristome* as in *Bryum,* between which and *Orthodontium* it seems to form an intermediate link. As the genus is provisionally proposed, and consists of a single species, the reader is referred to the description of the species itself for the details. Name from λεπτος, *slender;* βρυον, *moss.*

2. *Leptobryum pyriforme* (*golden Thread-Moss*). (TAB. XXVIII.)

Bryum pyriforme *Hedw.* Hist. Musc. t. 3. f. 13. *Swartz. Hook. and Tayl. Bryol. Eur.*

B. (Leptobryum) pyriforme. *Bryol. Eur.* (Conspectus).
Bryum aureum *Schreb.* *Turner.* *Smith,* Eng. Bot. t. 389.
Webera pyriformis *Hedw.* St. Cr. i. t. 3. *Funck,* Deutsch. Moose, t. 25. f. 1. *Schwaegr.* *Bridel.*
Mnium pyriforme *Linn. jun.* *Dill.* Musc. t. 50. f. 60.
Hypnum pyriforme *Web. and Mohr.*
Dicranum laxifolium *Bridel ?*

Hab. Rocks, especially of sandstone. Abundant by the roadside, 2 miles E. of Warrington. Fr. May, June.

Growing in dense, broad, silky patches of a bright green colour. Stems simple, about one-fourth of an inch long, very slender, rooting only at the base. Lower leaves lanceolate, entire, scattered; upper leaves longer, the terminal ones crowded into a spreading tuft and much elongated, linear-setaceous, slightly serrated, somewhat flexuose, flattish, nerved almost or quite to the apex; areolæ oblong. Inflorescence synoicous. Fruitstalk slender, flexuose. Capsule inclined or pendulous, pear-shaped, glossy, golden-brown, of thin texture, but not shrinking when dry, somewhat pellucid, the mouth rather small. Sporangium smaller than the cavity of the capsule. Lid convex, mammillate. Peristome as in *Bryum*, the inner one with ciliary processes two together, alternating with the principal segments. Annulus distinct.

Dicranum laxifolium of Bridel (*Bryol. Univ.* i. 431.), according to a specimen in *Herb. Arnott*, from M. Requien, appears to be only a lax variety of this moss with secund leaves.

51. BRYUM.

Bryum *Hook. and Tayl.*

Perennial mosses, with terminal fructification, growing on the ground or on rocks, rarely on the trunks of trees, in dense tufts.

Capsule pyriform, clavate, or oblong, inclined or pendulous, smooth, with a tapering neck or apophysis varying in length, on a long fruitstalk. *Annulus* simple or compound, spirally unrolling, absent in some species. *Lid* convex, more or less pointed, or sometimes shortly rostellate. *Calyptra* small, cucullate, fugacious. *Peristome* double; *outer teeth* 16, equidistant, lanceolate, marked externally with a medial line, transversely barred, the bars internally prominent, hygroscopic, incurved or connivent when dry; *inner peristome* a membrane divided half-way down into 16 carinate processes, alternating with the outer teeth, with or without intermediate cilia, which are filiform, and either solitary or two or three together, with or without prominent appendages at the internodes. *Spores* rather small, smooth, globular, green or reddish-brown.

Stem with innovations from the floral apex; *innovations* simple or branched, resembling the parent stem, tomentous with radicles.

Leaves mostly in 8 rows, semiamplexicaul, more or less decurrent, ovate, ovate-lanceolate, or lanceolate, concave, entire or denticulate in the margin, which is either recurved or plane, and sometimes thickened, so as to form a tumid border; *areolation* composed of rhomboid cellules; *nerve* reaching to or beyond the summit, or ceasing below it; the uppermost leaves of the stem and innovations larger than the rest.

Inflorescence synoicous, monoicous, or dioicous. *Antheridia* sometimes, though rarely, naked in the axillæ of the upper leaves, usually inclosed in perigonial leaves, subcylindrical, shortly pedicellate, with filiform paraphyses. *Barren flowers* gemmiform, rarely discoid. *Archegonia* with filiform paraphyses.

Bryum is distinguished from *Mnium* by the mode of innovation of the stems, by the filiform paraphyses of the barren flower, by the texture of the leaves, and, in general, by the smaller size of the species.

Fifty-nine species of *Bryum* are described in the *Bryologia Europæa.* For the sake of convenience, we have adopted a mode of arrangement of the species different from that of Bruch and Schimper. *Bryum* is an ancient name of Dioscorides, given by Dillenius to this genus and its affinities.

SECT. I. *Leaves narrow, erect; nerve ceasing below the apex.*

* Capsule narrow, inclined.

a. Inflorescence monoicous.

23 1. *Bryum acuminatum* Br. and Sch. (*sharp-pointed Thread-Moss*); monoicous; stem simple or branched, with innovations, rooting at the base; lower leaves ovate-lanceolate, erect; upper leaves fastigiate, crowded, twice as large, linear-lanceolate, subplicate, margin recurved, nerved to the apex; capsule slender, with a long tapering neck, horizontal; lid acutely conical. (TAB. XLVII.)

Bryum acuminatum *Br. and Sch.* Monogr. p. 21. t. 6.
Pohlia acuminata *Hoppe and Hornsch. Bridel.*

Hab. On the Scottish and Welsh mountains. Teesdale, *Mr. Spruce.* Fr. August.

Growing in tufts, chiefly in the crevices of rocks. Stem slender, $\frac{1}{2}$—1 inch in height, at first simple, subsequently branched. Leaves erect, straight, sometimes secund, more rigid and more crowded than in the next species; the nerve thicker and stronger, reaching to the apex, which is obscurely serrulate; areolæ narrower. Barren flower gemmiform, either near the base of a fertile flower, or terminal on a branch or separate stem. Fruitstalk rather abruptly bent at the top, 6—7 lin. long, reddish. Capsule much inclined, almost horizontal, slender, clavate, with a long tapering base, when dry more erect, and slightly constricted below the mouth. Lid acutely conical, sometimes rostellate. Annulus compound. Peristome large, outer teeth incurved when dry; inner peristome mostly destitute of cilia, the segments narrow. Spores small.

Distinguished from the next species by the inflorescence and by the more rigid leaves. Numerous varieties of this moss once distinguished as species are given in the *Bryologia Europea*, viz:—

var. β. minus; fruitstalk shorter; capsule smaller; lid shortly conical, rather obtuse.—Pohlia minor *Schleicher. Schw.* Suppl. t. 64. *Hoppe and Hornsch. Bridel.*

var. γ. polysetum; leaves shorter; capsules usually two together; fruitstalk bent, flexuose; capsule short-necked, thicker, more inclined; lid smaller.—Pohlia polyseta *Hoppe and Hornsch.* P. xanthocarpa *and* pulchella *Hoppe and Hornsch. Bridel.*

var. δ. tenellum; stem elongated, with numerous branches at the base; fruitstalk short, curved, capsule as in var. γ.—Pohlia tenella *Hoppe and Hornsch.*

var. ε. arcuatum; stem mostly simple; upper leaves small, erect; fruitstalk much curved in the upper part; capsule drooping, longer than in the two preceding varieties.—Pohlia arcuata *Hoppe and Hornsch.* P. vegeta *and* patens *H. and H.* (ex parte).

var. εβ. curvirostrum; more dwarfish; capsule clavate; lid shortly and obliquely rostellate.

var. εγ. xanthocarpum; small; fruitstalk short, curved; capsule short-necked, paler; lid mammillate.

224 2. *Bryum polymorphum* Br. and Sch. (*changeable Thread-Moss*); monoicous; antheridia free, axillary; stem simple or with innovations, slender, sparingly radiculose; lower leaves scattered, ovate-lanceolate, small; upper leaves larger, crowded, oblong-lanceolate, the nerve ceasing below the serrated apex; capsule oblong-pyriform, the neck shorter than the sporangium; lid mammillate. (TAB. XLVII.)

Bryum polymorphum *Br. and Sch.* Monogr. p. 25. t. 8.
Pohlia polymorpha *Hoppe and Hornsch. Bridel.*
Bryum elongatum *Smith*, Eng. Bot. t. 1603.?

Hab. On the Scottish and Welsh mountains. Fr. Summer.

This has usually been regarded in Britain as a small state of *Bryum elongatum*, with which it agrees in the inflorescence, but differs from it in the absence of cilia to the inner peristome. In size and in general aspect it much resembles *B. acuminatum*. Stems usually very short, rarely branched. Leaves shorter, erect, more evidently serrulate at the apex; the nerve thinner, ceasing below the apex; areolæ wider. Capsules often two together, more or less inclined or horizontal, oblong-pyriform, sometimes almost cylindrical, the tapering neck shorter than the sporangium, reddish-brown, wide-mouthed. Lid convex, with a short point. Annulus large. Peristome large, outer teeth reddish-brown, incurved when dry; inner peristome yellowish, cilia absent, or rudimentary.

The following varieties are mentioned in the *Bryologia Europæa*:—

var. β. affine; capsule more slender; lid longer. — Pohlia minor *Bridel* (ex parte). P. affinis *Hoppe and Hornsch.*

var. γ. strictum; stem elongated, straight, everywhere beset with imbricated leaves; upper leaves larger; capsule horizontal, oblong-pyriform.

var. δ. gracile; stem slender, elongated, naked or radiculose below; uppermost leaves spreading or imbricated; branches from the base of the stem, numerous, elongated; capsule shorter. — Pohlia gracilis *H. and H. Bridel.*

var. ε. brachycarpum; capsule thicker, pale greenish-yellow, constricted below the mouth; lid reddish-brown; fruitstalk straight or curved. — P. brachycarpa *H. and H. Bridel.*

var. εβ. cuvisetum; dwarfish; fruitstalk mostly curved; capsule smaller; terminal leaves imbricated. — Meesia curviseta *Schwaegr.* Suppl. 234.

25 3. *Bryum elongatum* Dicks. (*long-fruited Thread-Moss*); monoicous; antheridia free, axillary; lower leaves ovate-lanceolate; upper leaves oblong-lanceolate, serrated at the apex, nerve ceasing below the apex; capsule oblong-clavate, slender, long-necked, drooping or inclined; lid convex, shortly rostellate; cilia of the inner peristome more or less complete. (TAB. XXX.)

Bryum elongatum *Dickson*, Crypt. Fasc. 2. p. 8. *Turner? Smith?* (not *Eng. Bot.* t. 1603.?) *Hook. and Tayl.* (ex parte). *Br. and Sch.* Monogr. p. 32. t. 10, 11.
Pohlia elongata *Hedw.* St. Cr. i. t. 36.
Webera elongata *Schwaegr.* in Lin. Sp. Pl. ed. 4.
Leskea elongata *Web. and Mohr.*
Bryum cylindricum *Dicks.* Crypt. Fasc. 4. t. 11. f. 4.? *Smith.*
Pohlia cylindrica *Hoppe and Hornsch. Dill.* Musc. t. 50. f. 61. E.

Hab. In mountainous places, on rocks and in cavities of walls, banks, &c. Fr. August.

Stems ¼—1 inch long, simple; rooting towards the base, with a single innovation from the floral apex. Lower leaves scattered, slightly spreading, ovate-lanceolate; terminal leaves suddenly elongated, linear-lanceolate, more crowded, spreading or erect, margin recurved below, the nerve ceasing below the serrated apex. Fruitstalk 1—2 inches long. Capsule elongated or narrowly clavate, the neck longer in proportion than in the preceding species, suberect or horizontal, when dry mostly erect. Lid rostellate or pointed.

A larger species than the preceding, with more elongated capsules. It varies thus, according to Bruch and Schimper:—

var. γ. macrocarpum; capsule shorter, thicker, when dry and empty constricted below the mouth; inner peristome longer. — Webera macrocarpa *Hoppe and Hornsch.*

Bryum longicollum of Swartz, *Musc. Suec.* t. 6. f. 13. (*Webera* Hedwig, *Sp. Musc.* t. 41.) is now considered to be a distinct species (see *Bryol. Europ.* fasc. 32. p. 7.), but was originally confounded with the above by Bruch and Schimper, as *var. β. alpinum.* It is readily distinguished by the larger, broader, more glossy leaves, which are gradually, not suddenly, enlarged towards the summit of the stem, and by the shorter neck of the capsule, more abruptly passing into the fruitstalk, which is shorter and thicker. In aspect it much resembles *Bryum crudum.* We have not seen any British specimens, and therefore cannot insert it as a native. ***Bryum cylindricum*** of Dickson (whose figure is not unlike *B. longicollum*) was gathered near Halifax, and most probably belongs to *B. elongatum*, which is still found by Mr. Nowell, on Thievely Sconts, Cliviger, not far from Halifax. The Eng. Bot. *B. elongatum*, from Ingleborough, may be *B. polymorphum.*

b. Inflorescence synoicous, or dioicous.

226. 4. ***Bryum crudum*** Schreb. (*alpine glaucous Thread-Moss*); synoicous or dioicous, loosely cæspitose; stem simple, radiculose below; lower leaves broadly oval-lanceolate, entire; upper leaves longer, ovate-lanceolate; terminal leaves linear-lanceolate, flexuose, the nerve ceasing below the serrated apex; capsule oval-pyriform, or oblong, irregular; lid convex, more or less apiculate. (Tab. XXVIII.)

Bryum crudum *Schreber* Fl. Lips. p. 83. *Roth. Turner. Smith*, Eng. Bot. t. 1604. *Hook. and Tayl. Br. and Sch.* Monogr. p. 37. t. 13.
Mnium crudum *Hedw.* St. Cr. i. t. 37. *Schwaegr. Funck*, Deutsch. Moose, t. 32. f. 5. *Dill.* Musc. t. 51. f. 70. (and see t. 46. f. 17.)
Hypnum crudum *Web. and Mohr.* Bryum Polla cruda *Bridel.*

Hab. Banks and rocks, chiefly in mountainous places.
Fr. July.

Growing in glaucous-green patches. Stems 1—2 inches long, simple or branching at the base. Leaves gradually enlarged towards the summit of the stem, the lower ones broadly oval-lanceolate, flattish, with plane margins, the terminal ones much longer and serrated at the apex; they are scarcely altered by drying, and are always of a reddish tint at the base; the lower leaves especially have the nerve red, and all are beautifully glossy, and transparent. Fruitstalk flexuose, reddish, scarcely 1 inch long, often curved at the top. Capsule suberect, cernuous, or horizontal, sometimes pendulous, oblong-pyriform, or oblong, very variable in shape and direction; the neck or apophysis abrupt, or tapering, not unfrequently gibbous or crooked; and the fruitstalk suddenly bent at an angle just below the capsule, constricted below the mouth when dry. Lid short. Peristome small, pale; inner peristome with appendiculate cilia. This is one of the most elegant species of the genus.

** Capsule pyriform, pendulous.

a. Inflorescence monoicous or synoicous.

27 5. *Bryum nutans* Schreb. (*silky pendulous Thread-Moss*); synoicous (antheridia axillary, or mixed with the archegonia); upper leaves linear-lanceolate, serrated at the apex; lower leaves ovate-lanceolate, entire; capsule pendulous, oval-pyriform; lid mammillate. (Tab. XXIX.)

Bryum nutans *Schreb.* Spic. Fl. Lips. p. 81. *Turner. Smith*, Eng. Bot. t. 1240. *Hook. and Tayl. Br. and Sch.* Monogr. p. 34. t. 12.
Webera nutans *Hedw.* Stirp. Crypt. i. t. 4. *Schwaegr. Funck*, Deutsch. Moose, t. 25. n. 7.
Bryum (Webera) nutans *Bridel.* Hypnum *Web. and Mohr.*
Bryum compactum *Turner*, Musc. Hib. (not *Smith*, nor *Dickson*).
Bryum interruptum *Dickson*, Crypt. iv. 13. t. 11. f. 6. *Smith*, Fl. Brit.

Hab. On sandy and turfy heaths, and on banks in a sandy soil; frequent. Fr. May, June.

Stems cæspitose, sometimes scattered $\frac{1}{4}$—2 inches long, simple, reddish, with innovations from the floral apex. Leaves moderately spreading, suberect when dry, upper ones linear-lanceolate, serrulate at the apex, margin recurved below, nerve ceasing at or below the apex. Fruitstalk very variable in length, pale, reddish below. Capsule mostly pendulous, variable in shape, pyriform or almost elliptical, short-necked. Lid apiculate. Annulus large. Outer teeth incurved when dry; inner peristome with appendiculate cilia.

The following varieties are given in the *Bryologia Europæa*:—

var. β. cæspitosum; stem with fasciculate innovations, elongated; terminal leaves larger.—Webera cæspitosa *Hoppe and Hornsch.*

var. γ. bicolor; perichætial leaves erect, shorter; capsule shorter, thicker, variously coloured; sterile branches numerous, with ovate-imbricated leaves.—Webera bicolor *Hoppe and Hornsch.*

var. δ. subdenticulatum; dwarfish; leaves narrower; terminal tuft gemmiform; branches round, with imbricated concave leaves.—Bryum Webera subdenticulata *Mougeot and Nestl. Bridel.*

var. ε. longisetum; stem shorter, simple; terminal tuft of leaves large and spreading; fruitstalk very long; capsule large, constricted below the mouth.—Bryum Webera longiseta *Thomas*, in *Bridel*, Bryol. Univ.

The varieties δ. and γ. are peculiarly alpine, and the latter especially much resembles *B. cucullatum* of Schwaegrichen, which may, however, be distinguished by the large capsule, with a small lid; and its mouth is always inflexed when dry, so that the capsule then appears to be obovate; its peristome also is smaller and more delicate, and the cilia of the inner peristome are quite rudimentary. This species has not been found in Britain.

Perhaps the inflorescence of *Bryum nutans* may be more properly termed monoicous than synoicous; but we have followed Bruch and Schimper in their definition of the specific character. The axillary antheridia are constantly present; but the actual mixture of both organs on the receptacle itself, which is necessary to constitute a synoicous flower, is inconstant, and little to be depended upon, either in this moss, or in the analogous case of *Didymodon rubellus.*

b. Inflorescence dioicous.

228. 6. *Bryum annotinum* Hedwig. (*pale-fruited Thread-Moss*); dioicous; loosely cæspitose; lower leaves lax, erecto-patent, lanceolate, subserrulate; terminal leaves elongated, serrated at the apex, margin reflexed below, nerve ceasing below the apex; capsule subpendulous, oblong-pyriform; lid apiculate. (TAB. XLVII.)

Bryum annotinum *Hedw.* Sp. Musc. t. 43. *Turner. Eng. Bot.* t. 1862. (left-hand barren specimen only). *Schwaegr. Bridel. Br. and Sch.* Monogr. p. 40. t. 15. *Wilson,* in Suppl. Eng. Bot. t. 2856.
Webera annotina *Schwaegr.* in Lin. Sp. Pl. ed. 5.
Hypnum annotinum *Web. and Mohr.*

Hab. On sandy banks, and in quarries of new red sandstone; rare in fruit; abundant everywhere with axillary gemmæ.
Fr. May. June.

Stems growing in incoherent patches of a light yellowish-green colour; the fertile stems usually less than ½ inch long; barren stems, especially in moist shady places, 1 inch long or more. Lower leaves widely lanceolate, slightly concave, with plane margins; upper leaves gradually elongated, and more evidently serrated at the apex, below which the nerve disappears; areolæ rather larger than in the preceding species. Fruitstalk about 1 inch long or more. Capsule narrowly pyriform, with a long tapering neck, of a beautiful red tint, with a waxy transparency as it ripens, similar to that of *B. carneum;* when fully ripe, deep red, constricted below the mouth when dry. Annulus compound. Spores reddish. Barren flower terminal on a separate stem; the outer perigonial leaves more or less spreading. Sterile shoots with numerous axillary, bulb-like, fugacious gemmæ. (*Trentepohlia erecta* Roth.)

From *B. carneum* this species is distinguished by its larger size, by the narrowly pyriform annulate capsule, and by the more ovate closely cellular leaves. Small states of *B. annotinum*, with shortly pyriform capsules, are more closely allied to *B. pulchellum* Hedw.; but that species, like *B. carneum*, has no annulus. From *B. nutans* the species now under consideration is essentially distinguished by the inflorescence.

B. annotinum of Eng. Bot. t. 2434., so far as relates to the fruited specimen, appears to be a large luxuriant state of *B. capillare*, and is altogether unlike the true species, which is well figured by Hedwig. *B. nigricans* of Smith in *Eng. Bot.* may be *B. Wahlenbergii.*

29. 7. *Bryum carneum* Linn. (*pink-fruited Thread-Moss*); dioicous; loosely cæspitose or gregarious; stem erect or decumbent at the base; lower leaves lanceolate, or ovate-lanceolate, upper leaves narrowly lanceolate, all of them loosely cellular, serrulate at the apex, nerve vanishing; fruitstalk thick and succulent, bent immediately below the neck of the capsule; capsule ovate-oblong, subpendulous; lid convex-apiculate; peristome large; annulus none. (Tab. XXIX.)

Bryum carneum *Linn.* Sp. Pl. p. 1587. *Schwaegr. Turner. Smith,* Eng. Bot. t. 360. *Funck,* Deutsch. Moose, t. 29. f. 6. *Bridel. Hook. and Tayl. Br. and Sch.* Monogr. p. 42. t. 16. (*Mniobryum.*)
Bryum delicatulum *Hedw.* St. Cr. i. t. 20.
Bryum melanodon *Bridel,* according to *Br. and Schimper;* but see Bryol. Univ., Addenda.
Hypnum carneum *Web. and Mohr. Dill.* Musc. t. 50. f. 69. B—F.

Hab. Moist banks, chiefly in a clayey soil. Fr. April.

Stems short, rarely exceeding 2 or 3 lines, often bearing innovations, more frequently throwing out sterile shoots from among the roots, reddish. Leaves suberect, dull green, more or less lanceolate, loosely reticulated; nerve reddish, vanishing below the serrated apex; margin plane. Capsule more or less drooping, or pendulous, small, flesh-coloured, ovate-oblong, inclining to pyriform, the short neck quickly passing into the thick, succulent, reddish fruitstalk, which is bent at the very summit, and not at some distance below, as in the preceding species and in the nearly allied *B. pulchellum;* hence the neck itself of the capsule is frequently somewhat bent, and the capsule appears gibbous on the upper side. Annulus none. Peristome large, the outer teeth deeply coloured, blackish-red when dry.

This species is easily known by the large reticulation of the leaves, and by the peculiarities of the capsule and fruitstalk above indicated, which especially serve to distinguish the species from *B. pulchellum* of Hedwig, a species not found in Britain.

Sect. II. *Leaves ovate, nerve ceasing below the apex.* (*Dioicous.*)

0. 8. *Bryum Wahlenbergii* Schwaegr. (*Wahlenberg's Thread-Moss*); dioicous; loosely cæspitose; stem erect or decumbent at the base; lower leaves remote, ovate-acuminate; terminal leaves lanceolate, nerve ceasing below the serrated apex; capsule shortly pyriform, exannulate, subpendulous; lid small; peristome large. (Tab. XLVII.)

Bryum Wahlenbergii *Schwaegr.* Suppl. t. 70. *Funck,* Deutsch. Moose, t. 29. f. 7.? *Bruch and Schimper,* Monogr. p. 44. t. 17. (*Mniobryum.*)

Hypnum Wahlenbergii *Web. and Mohr.* Bot. Tasch. p. 280. 475.
Bryum albicans *Bridel. Hooker*, in Eng. Fl. *Wilson*, in Eng. Bot. Suppl. t. 2836.
Mnium albicans *Wahlenbr.* Fl. Lapp.
Bryum ventricosum *Smith*, Eng. Bot. 2272. *Turner* (not of *Dickson*).
Bryum compactum *Dickson*, Crypt. iv. t. 11. f. 11. *Smith*, Eng. Bot. t. 1527. (not of *Turner*, Musc. Hib.) *Dill.* Musc. t. 50. f. 69. G.
Bryum nigricans *Dickson*, Crypt. iv. 15. t. 11. f. 10. (Herb. Turner); not of Eng. Bot. t. 1528.
Bryum nitens *Swartz MSS.* in Herb. Turner.

Hab. On wet banks, ditches, &c., and on dripping rocks by rivulets. Fr. May.

A larger species than the preceding, growing in extensive pale glaucous-green patches, ripening its fruit a month later. Stems ½—1 inch long, reddish. Leaves larger, lower ones ovate-acuminate, upper ones lanceolate, and more evidently serrated at the apex, all more or less spreading, margin slightly reflexed, areolation rather lax. Fruitstalk 1 or 2 inches long, reddish. Capsule shortly pyriform, regular, short-necked, more or less pendulous, reddish as it ripens, its texture thick and succulent, somewhat turbinate and wide-mouthed when dry. Annulus none, or rudimentary. Outer teeth reddish-brown; inner peristome with cilia 2 or 3 together. Barren flower spreading, almost discoid, hence very conspicuous, terminal on a slender separate stem.

The var. β. *glaciale* (*B. glaciale* Schleicher, Bridel) is a large state of the species, resembling *B. turbinatum var. Schleicheri.* Small states of *B. Wahlenbergii* approach *B. carneum.* The peculiar pale glaucous-green colour of the foliage generally marks the species; hence Wahlenberg's original name *albicans* is very apposite, though rejected by Weber and Mohr and Schwaegrichen.

Some difference of opinion exists concerning Funck's moss, above cited; but Weber and Mohr, who first described the species, say, "Exemplaria Funckiana cum Wahlenbergianis optime conveniunt."

231. 9. *Bryum Ludwigii* Sprengel (*Ludwig's Thread-Moss*); dioicous; fertile stem decumbent at the base, with suberect innovations; lower leaves ovate, upper leaves ovate-lanceolate, terminal leaves lanceolate, concave, serrulate at the apex, margin reflexed, nerve ceasing below the apex; fruitstalk very slender, geniculate at the base; capsule oblong-subpyriform, annulate; lid conical, more or less obtuse. (Tab. XLVII.)

Bryum Ludwigii *Sprengel*, in *Schwaegr.* Suppl. t. 68. *Funck*, Deutsch. Moose, t. 29. f. 9. *Bridel. Wilson*, in Eng. Bot. Suppl. t. 2855. *Br. and Sch.* Monogr. p. 38. t. 14.

Hab. Clova mountains, at a considerable elevation, near the limits of perpetual snow, on declivities by ravines, &c. Ben Lawers, Ben Nevis, &c; rarely seen in fruit. On Carnedd Llewelyn, N. Wales; barren. Fr. Sept.

Growing in bright-green extensive patches, the lower part of the stem always decumbent and usually buried in the light blackish soil in which the moss loves to grow. Stem 1 inch long and more, reddish above, blackish below. Leaves more or less spreading, and concave, rather obtuse at the apex, which is slightly serrated, frequently decurrent at the base, scarcely glossy, of a full bright-green colour, the lower faded leaves of a reddish tint, margin reflexed below, nerve ceasing below the apex. Fruitstalk 1 inch long, flexuose, very slender, reddish, suddenly bent below the neck of the capsule, which is subpendulous, obscurely pear-shaped or oblong-oval, slightly incurved, tapering below into the fruitstalk, brownish, slightly constricted near the mouth when dry. Annulus present. Lid conical, obtuse, or pointed. Inner peristome with cilia 2—3 together. Barren flower truly and compactly gemmiform, at first terminal, subsequently lateral.

The slender variety β. *gracile* (sent by Hedwig to Mr. Turner, named *B. turbinatum*) (*B. gracile* Schleicher, *B. nivale* Hook. MSS.) has the leaves narrower, more appressed, the capsule shorter, and the sterile branches, which are remarkably slender, bear axillary bulb-like gemmæ. This form seems peculiar to the higher Alps of Switzerland; but an intermediate variety occurs near the summit of Ben Lawers, agreeing with the form assumed as the type of the species by Bruch and Schimper, and having the leaves somewhat carinate, less concave, more acute, and more erect and crowded than the form figured by Schwaegrichen, which is the same as that given in the Supplement to *Eng. Bot.* In the Clova specimens the leaves are more spreading, especially in a dry state, somewhat flaccid, scarcely serrulate at the apex; and in some barren states collected by Mr. W. Gardiner, they are so much decurrent as to strongly resemble *Bryum Duvalii.*

B. Ludwigii cannot easily be confounded with *B. annotinum*, if due attention be paid to the capsule and its junction with the fruitstalk, and to the form and size of the leaves. They differ materially in their place of growth, and in general aspect.

Bryum Duvalii Voit may be expected to occur on the Scottish mountains, but as yet we have seen no indisputable specimens. As compared with *B. Ludwigii*, the species may be known by its lax, acute, more strongly decurrent, plane-margined, entire leaves, which are undulated when dry, and by the regularly pyriform pendulous capsules; it may thus be considered to resemble a tall slender state of *B. turbinatum.*

SECT. III. *Leaves mostly ovate, nerved to the apex.*

a. Inflorescence synoicous.

2. 10. *Bryum lacustre* Bridel (*small round-fruited Thread-Moss*); synoicous; stem branched, erect, radiculose, leafless below; lower leaves ovate-acuminate, upper leaves ovate-lanceolate, concave, entire, nerved almost or quite to the apex, margin recurved; perichætial leaves narrower; capsule subpendulous, pyriform, annulate; lid small, apiculate; inner peristome with rudimentary cilia. (TAB. XLVIII.)

Bryum lacustre *Brid.* Mant. Musc. p. 120. *Br. and Sch.* Monogr. p. 16. t. 2.

Bryum Webera lacustris *Bridel. Bryol. Univ.* B. cernuum *Ib.*

Mnium lacustre *Bland. Schwaegr.* Suppl. t. 79. *Röhling.*

Hypnum lacustre *Web. and Mohr.* Pohlia lacustris *Huebener.*

Bryum bicolor *Turner,* Musc. Hib. t. 11. f. 2.! (Herb. Turner) not of *Dickson.*

Bryum cæspiticium var. *Hook. and Tayl.*

Hab. Moist, sandy places. Wangford, near Brandon, Suffolk, 1804, *F. K. Eagle, Esq.* On the marsh near the Turnpike Gate, Yarmouth, *D. Turner, Esq.*; see *Bot. Guide.*
Fr. May, June.

Gregarious, or loosely cæspitose. Stems very short, not exceeding 3 or 4 lines, simple or slightly branched, reddish. Leaves spreading, rather lax, broadly ovate, shortly acuminate or apiculate, very concave, recurved in the margin, widely areolate, nerved nearly (more rarely quite) to the apex, which is entire. Capsule small, short-necked, subpyriform, sometimes roundish, small-mouthed, not constricted below the mouth when dry, reddish-brown, the fruitstalk bent immediately below the neck. Annulus broad. Peristome short; inner partially adhering to the outer, destitute of cilia, the processes narrow and perforated. Spores rather large.

From the other species with synoicous inflorescence this may be known by its smaller, shorter capsules, and by the broad, concave, loosely cellular leaves, which have the nerve usually vanishing below the point. The inner peristome, with rudimentary cilia, connects the moss with *B. inclinatum*, and with the Bridelian genus *Cladodium.* The *var. β. alpinum* of Br. and Sch. has narrower leaves and more slender capsules. This species appears to be rare in Britain.

B. bicolor of Turner, *Musc. Hib.* is figured from Yarmouth specimens; the Irish ones belong to *B. sanguineum.*

b. Inflorescence dioicous.

233. 11. *Bryum pseudotriquetrum* Schwaegr. (*alpine-bog Thread-Moss*); dioicous; cæspitose; stem more or less elongated, robust, erect, sparingly branched, radiculose; leaves more or less spreading, subdecurrent, lower ones ovate-lanceolate, upper ones larger, concave, with a slight border, margin recurved, entire or subserrulate at the apex, nerve reaching to or slightly beyond the summit; capsule oval-pyriform, oblong or subcylindrical, pendulous; lid mammillate. (TAB. XXX.)

Bryum pseudotriquetrum *Schwaegr.* Suppl. i. 2. p. 110. *Br. and Sch.* Monogr. p. 54. t. 24. *Funch,* Deutsch. Moose, t. 31. f. 21.

Mnium pseudotriquetrum *Hedw.* St. Cr. iii. t. 7. (partly).

Bryum ventricosum *Schwaegr.* in *Linn.* Sp. Pl. *Swartz,* Musc. Suec. *Hook. and Tayl.* (partly), not of *Dickson.*

Bryum cubitale *Dickson*, Crypt. Fasc. 2. t. 5. *Smith*, Eng. Bot. t. 2554. *Bridel*, Meth. *Dill.* Musc. t. 51. f. 73. F.

var. β. compactum; smaller, more densely and compactly tufted; capsule small; lid more pointed.

Hab. On wet rocks and banks, chiefly in mountainous places. Frequent on the Scottish and Welsh mountains, but not yet ascertained to grow in Ireland. Fr. July.

Growing in large patches of a deep green colour, inclining to blackish or purplish. Stems 1—3 inches long. In all the parts very much like *B. bimum*, with which it has usually, in Britain, been confounded. From that species it is distinguished by the dioicous inflorescence; the leaves also are more rigid, especially when dry, and the capsule is usually more elongated. Its habit, also, is more robust.

B. ventricosum of Eng. Bot. t. 2272. (and perhaps, also, of Smith, Turner, and Dickson) seems to belong to *B. Wahlenbergii.* The synonymy of the species, so far at least as belongs to the works of British writers, is extremely confused. The error appears to have originated in the misapplication of the synonym *B. pseudotriquetrum*, in Smith, *Fl. Brit.*, which truly belongs to Dickson's *B. cubitale.* Dickson's *B. ventricosum* (*Dill.* t. 51. f. 72.) belongs to *B. bimum* (a name not known to Dickson), and is improperly united to *B. ventricosum* of Eng. Bot. *B. ventricosum* of Hooker and Taylor combines three species; that of Turner, *Musc. Hib.* is merely *B. bimum;* that of Smith is *B. Wahlenbergii.*

34. 12. *Bryum alpinum* Linn. (*alpine-purple Thread-Moss*); dioicous; densely tufted; stem simple, somewhat radiculose; leaves crowded, imbricated, straight, lanceolate, nearly entire, margin recurved, nerve rigid, subexcurrent; fruitstalk geniculate at the base, arcuate at the summit; capsule pendulous, oblong-pyriform, constricted below the mouth when dry. (TAB. XXVIII.)

Bryum alpinum *Linn.* Syst. Pl. p. 949. *Turner. Smith*, Eng. Bot. t. 1263. *Schwaegr.* Suppl. t. 73. *Funck*, Deutsch. Moose, t. 29. f. 11. *Hook. and Tayl. Br. and Sch.* Monogr. p. 76. t. 39. *Dill.* Musc. t. 50. f. 64.

Hab. On moist rocks in subalpine countries, not uncommon; seldom in fruit. Sometimes found on rocks, very near the sea level, barren. Fr. June.

Growing in dense, deep red, shining tufts. The stems simple or branched, ½—3 inches long, rather rigid. Leaves straight and rigid, suberect, straight and imbricated when dry, the margin conspicuously recurved, red or purplish and shining, the strong nerve continued to or beyond the apex. Capsule deep red as it ripens. This, one of our most elegant species, smaller than the preceding, and is usually known by the brilliant-coloured foliage.

35. 12*. *Bryum Mühlenbeckii* Br. and Schimp. (*Mühlenbeck's Thread-Moss*); dioicous; somewhat tufted; stems dichotomously branched, fastigiate, radiculose; leaves suberect, imbri-

cated, elliptic-oblong, concave, bluntish, margin revolute; capsule oblong, more or less pendulous. (Tab. XLVIII.)

B. Mühlenbeckii *Bryol. Europ.* fasc. 32. p. 11. t. Suppl. 13.

B. alpinum *Dickson,* in Herb. Turner.

Hab. On moist rocks on mountains. Devonshire (according to a specimen in *Herb. Hooker,* named *B. alpinum*).

Fr. Sept.

No certain British locality is known; and besides Mr. Dickson's specimen in *Herb. Turner*, and another specimen, said to have been gathered in Devonshire, we have no proof of its being indigenous. *B. Mühlenbeckii* appears to be an alpine species, and was first detected on wet rocks on Mount St. Gothard, in 1839, by Mühlenbeck. It is nearly allied to *B. alpinum*, having deep red foliage, but differs from it as follows: Leaves more loosely reticulated, larger, wider, elliptical, concave, obtuse, almost cucullate at the apex, margin revolute, nerve vanishing below the summit, colour dull red, inclining to olive, not glossy; capsule reddish-brown, not sanguineous.

231. 13. *Bryum turbinatum* Hedw. Schwaegr. (*pear-fruited Thread-Moss*); dioicous; stem more or less elongated, simple or sparingly branched; leaves ovate-acuminate, concave, margin not recurved, nerve subcontinuous; capsule pendulous, ventricose-pyriform, constricted when dry. (Tab. XLVIII.)

B. turbinatum *Schwaegr.* Suppl. i. 2. p. 109. *Swartz. Funck*, Deutsch. M. t. 30. f. 20. *Br. and Schimp.* Monogr. p. 65. t. 32.

Mnium turbinatum *Hedw.* St. Crypt. iii. t. 8. Hypnum *Web. and Mohr.*

var. β. prælongum; stem elongated; leaves remote, tender, pale green; capsule large, ventricose.

B. Schleicheri β. tenerius *Schwaegr.* B. glaciale *Schleich.* (partly).

var. γ. latifolium; stem elongated; leaves large, broadly ovate, acuminate, very concave, serrulate at the apex, slightly margined, loosely imbricated, firm, glossy, nerve excurrent; capsule large.

B. latifolium *Schleicher. Schwaegr.*

B. polla latifolia *Bridel.*

B. Schleicheri *Schwaegr.* Suppl. t. 73.

Hab. In wet mountainous places, according to Bruch and Schimp., but not hitherto ascertained to be a native of such districts in Britain; *B. pallens*, and small varieties of *B. pseudotriquetrum*, with other species, having been commonly mistaken for it. The only stations where it has been found are Scarwheel, by the Irwell, above Manchester, and near Fakenham, Norfolk: found in the latter place by *Mr. G. Fitt.*

Fr. June, July.

Variable in size; the smaller states resembling *B. pallens*, the larger ones approaching *B. Wahlenbergii var. glaciale.* In patches of a pale green colour (sometimes reddish, according to Bruch and Schimper). Stems $\frac{1}{2}$—3 inches long. Lower leaves lax, ovate-lanceolate; uppermost ones oblong-lanceolate, subdecurrent, concave; margin not at all recurved in the upper half, moderately spreading, when dry erect and slightly crisped, more or less glossy, pale green; marginal cellules in the typical (and in our British) specimens similar to the rest, rather large, narrower in the var. γ., which has the leaves slightly bordered; nerve ceasing at or near the apex. Capsule pendulous, symmetrical, roundish pear-shaped, reddish-brown, constricted below the mouth when dry. Lid convex, apiculate. Outer teeth incurved when dry.

There is good reason to believe that *B. turbinatum*, though enumerated as a British species in various works, is quite a recent addition to our list. There is no genuine Irish specimen in *Herb. Turner*, nor any British one in *Herb. Hook.*, or in any other collection to which we have access. The reported Teesdale specimen, mentioned by Mr. Spruce in a recent publication, is certainly a variety of *B. pallens*; and the figure in *Eng. Bot.* t. 1572. has the leaf far too much flattened, and the nerve too much excurrent, for this species, which may always be distinguished from *B. pallens*, its nearest ally, by the concave, not margined leaves, as well as by the symmetrical capsule, constricted when dry below the mouth.

B. turbinatum var. latifolium (not found in Britain) may prove to be a distinct species, having the leaves much wider and more concave, with a distinct border of narrow, close, marginal cellules. The larger states of *B. turbinatum* have been confounded with this, of which probably *B. neodamense* of Itzigsohn is a singular variety.

Hedwig sent *B. Ludwigii var.* β. to *Herb. Turner*, under the name of *B. turbinatum.*

237. 14. *Bryum pallens* Swartz. (*pale-leaved Thread-Moss*); dioicous; loosely cæspitose; stem short, with slender elongated branches; leaves lax, more or less spreading, ovate-acuminate or oval-lanceolate, decurrent, carinate, entire, the border slightly thickened and recurved, nerve somewhat excurrent; capsule subclavate-pyriform, incurved, subpendulous, long-necked; lid small, convex, pointed. (TAB. XXIX.)

Bryum pallens *Swartz*, Musc. Suec. t. 4. *Schwaegr.* Suppl. t. 72. *Bridel. Br. and Sch.* Monogr. p. 68. t. 33.
Hypnum pallens *Web. and Mohr.*
Bryum turbinatum (partly) *Hook. and Tayl. Dill.* Musc. t. 51. f. 74.

var. β. *microstomum;* capsule regular, subclavate, with a smaller mouth.

Bryum speciosum *Voit,* in *Sturm.* Fl. Germ. Crypt.

var. ββ. *minus;* stem shorter; capsule short-necked, ventricose-obovate.

Hab. In moist places, near springs and in ditches. Fr. June.

Growing in more or less extensive patches, remarkable for the pale reddish hue of the foliage. Stems from 3 lines to 1 inch long, red. Leaves remote, spreading, slightly recurved, suberect and slightly crisped when dry, reddish and subdiaphanous, slightly decurrent, ovate-acuminate, somewhat carinate, slightly concave, and entire, the margin slightly thickened as well as reflexed, the narrow cartilaginous border consisting of a double layer of cellules; nerve slightly excurrent. Fruitstalk varying in length, one or two inches long, more or less curved at the top. Capsule narrowly pyriform, with a long tapering neck, slightly incurved, sometimes regular and shortly pyriform, pale brown, when dry narrowed at the mouth, but not constricted below it, and the neck plicate.

The pale reddish tint of the margined leaves will serve to distinguish this from all the allied species, and more especially from *B. turbinatum.*

SECT. IV. *Leaves ovate; nerve excurrent.*

a. Inflorescence monoicous.

238. 15. *Bryum uliginosum* Br. and Sch. (*bog Thread-Moss*); monoicous; cæspitose; stem radiculose, rather short, branched; leaves oval-lanceolate, margin reflexed below, plane above, its cellules narrow, lower leaves erect, upper ones spreading, tufted, nerve excurrent; capsule pendulous, clavate, irregular, the mouth small and oblique. (TAB. XLVIII.)

Bryum uliginosum *Br. and Sch.* Monogr. p. 18. t. 4.
Pohlia uliginosa *Al. Braun* to *Bruch.*
Cladodium uliginosum *Bruch.*
Webera intermedia *Schwaegr.* Suppl. t. 75. (ex parte).

Hab. In wet places, near rills, &c. Fr. August.

Resembling *B. pallens* in the capsule and general aspect, but ripening later in the summer; the foliage green, not reddish; the stem usually longer and more branched; fruitstalk longer; capsule larger, clavate, not pyriform, gibbous at the back near the mouth, which thus appears to be oblique, as in *Funaria hygrometrica;* cilia of the inner peristome mostly wanting or imperfect. Spores greenish, as in *B. pallens.* Leaves larger, more spreading, less ovate, denticulate at the apex. It is most certainly distinguished by the monoicous inflorescence. The flowers are said to be sometimes synoicous, as in *B. inclinatum*, from which this species is known by the paler, clavate, not pyriform capsules, and by the strongly inflexed teeth of the dry outer peristome. Barren flowers gemmiform, terminal on short lateral branches.

239. 16. *Bryum pallescens* Schwaegr. (*tall-clustered Thread-Moss*); monoicous; cæspitose; stem branched, radiculose; leaves ovate-lanceolate, entire, margin reflexed, nerve mostly excurrent; capsule oblong-pyriform, drooping; lid conical-acuminate. (TAB. XLVIII.)

Bryum pallescens *Schwaegr.* Suppl. t. 75. *Bridel. Br. and Sch.* Monogr. p. 51. t. 22.
Bryum speciosum *Voit,* in *Sturm.* Fl. Germ. fasc. 14.
B. rupincolum *Schleich. MS.*

var. β. boreale; much branched, terminal leaves spreading; capsule smaller, suberect or drooping.

B. boreale *Schwaegr.* Suppl. t. 69. *Bridel.* (Hypnum *Web. and. Mohr.*)

var. γ. contextum ; tufts more compact; stem elongated, much branched; capsule shorter, ventricose, more or less drooping; fruitstalk shorter.

B. contextum *Hoppe and Hornsch.* Bot. Zeit. 1819, p. 91.

var. δ. subrotundum ; dwarfish; leaves smaller, suberect; capsule short, roundish, more deeply coloured; fruitstalk arcuate.

B. subrotundum *Bridel.* B. brunnescens *Schleich. MS.*
B. pohliæforme *Bridel.*

Hab. Rocks and walls in mountainous places; either rare in Britain, or overlooked as a variety of *B. cæspiticium.* Teesdale, *Mr. Spruce.* Near Clonmel, Ireland, *Mr. Sidebotham.* Ochill Hills, *Mr. T. Lyle.* Var. δ. on walls in Scotland, *Mr. T. Drummond.* Fr. July, August.

The stems of this species (often 1—2 inches long) are usually longer and more compactly tufted than in the allied species, and are remarkable for the copious purplish radicles among the lower leaves; branches subfastigiate, mostly bearing terminal flowers. Lower leaves ovate-lanceolate, scattered, reddish below, scarcely nerved to the summit; upper ones larger, with longer points, the nerve more or less excurrent, crowded into a spreading tuft, all concave, margin reflexed, entire or subserrulate at the apex, slightly twisted when dry. Capsule more or less drooping, oblong-pyriform, constricted below the mouth when dry, bright reddish-brown inclining to red, on a fruitstalk of the same colour. Outer peristome yellow, incurved when dry; inner peristome with appendiculate cilia. Lid longer and more acuminate than in the preceding species; barren flowers gemmiform, terminal on lateral branches.

This species is very variable in the size of the stem and capsule, according to the nature of the locality. In the reddish tint of the lower leaves, and in other features, it approaches to *B. intermedium,* but differs essentially in the inflorescence, and has usually a paler, quite symmetrical capsule, a more deciduous lid, and larger peristome. The fruit, also, ripens all uniformly at one season.

b. Inflorescence synoicous.

* Inner peristome imperfect. (*Ptychostomum* Hornsch.; *Cladodium* Bridel.)

407. 17. ***Bryum cernuum*** Hedw. (*drooping Thread-Moss*); synoicous; stem branched, tufted, radiculose; leaves suberect, ovate-acuminate, concave, nerve excurrent; capsule ventricose-pyriform, with a small mouth and small conical lid; inner peristome adherent to the outer teeth. (TAB. XLVIII.)

Bryum cernuum *Br. and Sch.* Monogr. p. 14. t. 1.
Cynodontium cernuum *Hedw.* Sp. Musc. t. 9. *Schwaegr.*
Didymodon cernuum *Swartz,* Musc. Suec. t. 1. f. 2. (Herb. Turner.)
Ptychostomum cernuum *Hornsch. Bridel. Schwaegr.*

P. compactum *Hornsch. Schwaegr.* Suppl. t. 115. *Bridel.*
P. pendulum *Hornsch. Bridel.*
P. cæspiticium *Bridel.*

Hab. On walls and rocks, and on gravelly, sandy, or clayey ground, in waste places, not unfrequent, growing in company with *B. cæspiticium, inclinatum,* and *intermedium.* Fr. May.

Larger and more robust than *B. cæspiticium*, with which it has been usually confounded in Britain; the stems more compactly tufted, and copiously beset with radicles. Leaves ovate-acuminate, terminal ones crowded, slightly spreading, erect and scarcely crisped when dry, the margin recurved; nerve excurrent, entire or subserrate at the apex. Capsule more or less pendulous, varying from pyriform to oblong-oval, more or less ventricose and irregular, seldom symmetrical, smooth and somewhat polished, golden or rich olive-brown when ripening, slightly constricted below the mouth when dry, the mouth, peristome, and lid very small, as in the next species, which it otherwise much resembles, differing chiefly in the adhesion of the inner peristome to the outer teeth, which are more obscurely trabeculated. Spores as in that, large, greenish. Annulus large. Antheridia usually mixed with archegonia in the same flower, sometimes apart in a separate involucre.

After much hesitation, we at length admit this to be different from *B. inclinatum*, though assuredly very closely allied. It may usually be known by its more crowded and erect leaves, more swollen and ventricose capsules, which are less coloured in the border of the mouth, and by the mutually adherent peristomes. In the inflorescence it agrees with *B. bimum*, small states of which are occasionally found growing upon walls, but that has the mouth of the capsule larger, and the inner peristome is free, and furnished with cilia.

241 18. *Bryum inclinatum* Br. and Sch. (*small-mouthed Thread-Moss*); synoicous; cæspitose; stem rather short, radiculose, sparingly branched; leaves spreading, ovate-acuminate, or ovate-lanceolate, entire, nerve excurrent; capsule pendulous, more or less pyriform and ventricose, small mouthed; lid apiculate. (Tab. XLIX.)

Bryum inclinatum *Br. and Sch.* Monogr. p. 17. t. 3.
Pohlia inclinata *Swartz,* Musc. Suec. t. 5. f. 11. *Bridel. Schwaegr.* Suppl. t. 63. (Leskea *Web. and Mohr.*)
Cladodium inclinatum *Bridel.*
Bryum turbinatum (partly) *Hook. and Tayl.*
Bryum longisetum *Schwaegr. Blandow.*

Hab. On walls, banks, &c., not uncommon, with the preceding species; sometimes on decaying trunks of trees. Fr. May.

Very like the preceding species in general aspect and character. Stems usually less tufted. Leaves more spreading, less ovate, inclining to ovate-lanceolate. Capsules usually more slender, and symmetrical, with a redder border about the mouth, arising from the more deeply coloured bases of the outer teeth. Lid more sharply apiculate. Peristome small, as in the preceding; outer teeth more strongly trabeculated within, not united to the inner peristome, which has narrow perforated segments, and usually no intermediate cilia, or such as are merely rudimentary. Spores large, greenish.

If due attention be paid to the inflorescence, and to the small-mouthed capsules, of this and the preceding species, they will not be confounded with *B. cæspiticium*, nor with the allied species. The small varieties of *B. bimum* are distinguishable by the large mouth of the capsule, and by the perfectly formed inner peristome.

** Inner peristome perfect.

242. 19. *Bryum intermedium* Bridel (*many-seasoned Thread-Moss*); synoicous; cæspitose; stem radiculose, branched, sterile branches slender, with loosely imbricated leaves; leaves more or less spreading, ovate-acuminate or ovate-lanceolate, nerve excurrent; capsule pendulous, narrowly pyriform, subclavate, long-necked; lid more or less apiculate. (TAB. XLIX.)

Bryum intermedium *Bridel,* Mant. p. 120. *Br. and Sch.* Monogr. p. 47. t. 19.
Webera intermedia *Schwaegr.* Suppl. t. 75.
Bryum Webera intermedia *Bridel.*
Bryum turbinatum (partly) *Hook. and Tayl.*
B. pallescens var. *β. Huebener.*

Hab. On walls and rocks, and in sandy, clayey, or gravelly places, frequent; generally overlooked as a state of *B. cæspiticium.* Fr. June—Dec.

This is a very common species, remarkable for ripening its fruit in the same tuft at successive periods. When growing on the same wall with *B. cæspiticium* it does not usually make its appearance until after that has ripened its capsules, and then continues to put forth its fruit for several months. Stems from two lines to half an inch long; barren slender branches elongated and flagelliform, the rest fastigiate and shorter. Leaves more or less spreading; imbricated and erect, scarcely crisped when dry, lower ones reddish; all ovate-acuminate, more or less concave; margin reflexed; nerve excurrent, sometimes denticulate. Capsule subpendulous, oblong pyriform or clavate pyriform, more slender than in *B. cæspiticium*, symmetrical or often slightly incurved; the mouth rather small, with a reddish or purplish border, not constricted below the mouth when dry. Inner peristome with appendiculate cilia. Annulus and lid subpersistent, remaining longer than in the allied species.

Schwaegrichen appears to have confounded this species with *B. uliginosum* (Suppl. t 75.), and subsequently with *B. pallescens*, from both of which it is readily distinguished by the synoicous inflorescence; by the same character it is known from *B. cæspiticum*, which it resembles in the foliage, though not in the form of the capsule.

Bryum cirrhatum of Hoppe and Hornsch., at first considered by Bruch and Schimper to be only a variety of *B. intermedium*, has at length been admitted to rank as a species (*Bryol. Europ.* fasc. 32. p. 8.), and is thus distinguished: Leaves smaller, the excurrent part of the nerve denticulate; capsule regular, obconical, constricted below the mouth when dry; lid larger; intermediate between *B. intermedium* and the smaller varieties of *B. bimum*, which it resembles in the capsule and mode of growth. Specimens from walls at Egglestone, Durham, July 1843, given by Mr. Spruce, partly named "B. intermedium," and partly "B. pallescens," with synoicous flowers, agree tolerably with authentic specimens of *B. cirrhatum* from M. Schimper in the form of the capsule, but not in general aspect, in which they resemble *B. pallescens*, and may belong to *B. bimum var. β.* Being, therefore, dubious about *B. cirrhatum*, we content ourselves with giving this short notice, until it shall have been fully established as a native of Britain, and as a distinct species.

243. 20. *Bryum bimum* Schreb. (*Lowland-bog Thread-Moss*); synoicous; cæspitose; stem longer or shorter, simple or branched, radiculose; leaves spreading, ovate-lanceolate, carinate, margin recurved, nerve subexcurrent; capsule pendulous, oblong-pyriform; lid rather large, mammillate. (Tab. XLIX.)

Bryum bimum *Schreb.* Sp. Fl. Lips. p. 83. *Turner. Smith?* Eng. Bot. t. 1518. *Funck*, Deutsch. Moose, t. 31. f. 22. *Br. and Sch.* Monogr. p. 50. t. 21.

B. ventricosum *Dickson. Turner. Hook. and Tayl.* (partly). *Dill.* Musc. t. 51. f. 72. (not of *Smith*, Eng. Bot.)

var. β. cuspidatum; stem short; leaves with longer bristly points, somewhat bordered. Webera affinis *Bruch*, in *Bridel*, Bryol. Univ.

Hab. In marshy and boggy places; var. β. on walls, and in drier situations. Walls at Egglestone, *Mr. Spruce.* Orford, near Warrington, *W. Wilson.* Fr. June, July.

Stems ½—2 or 3 inches long, growing in yellowish or lurid green patches, usually much matted by means of purplish radicles, which are copiously produced among the leaves; more or less branched. Leaves octofarious, lower ones distant, on the young shoots widely spreading, terminal leaves crowded and more erect, slightly twisted and erect when dry, ovate-lanceolate, somewhat decurrent, rigid, rather glossy, submarginate, entire or slightly serrated at the apex, nerve more or less excurrent, lower leaves blackish or reddish-brown. Fruitstalk varying in length from 1 to 3 inches, reddish-brown. Capsule more or less pendulous, oblong-pyriform or obconical, brown, constricted below the mouth when dry. Lid convex, apiculate, glossy. Annulus dehiscent.

This species, when growing in wet situations, much resembles *B. pseudotriquetrum*, but is somewhat less rigid, the leaves more spreading, more twisted when dry, and less glossy, and is essentially distinguished by the synoicous inflorescence. When growing in drier situations, as the variety β., it assumes quite another aspect, and (if attention be not paid to the inflorescence) may be mistaken for *B. pallescens;* it differs from the typical form in its smaller size, its leaves of a more lively green, with longer bristly points and shorter capsules. The Warrington specimens, growing on a wall with *B. cæspiticium*, can scarcely be distinguished at sight from that species, except by the pale roundish-pyriform capsule.

B. ventricosum of Dickson and of Smith are different species. See the remarks under *B. pseudotriquetrum.*

244. 21. *Bryum torquescens* Br. and Sch. (*twisting Thread-Moss*); synoicous; densely cæspitose; stem branched, radiculose; lower leaves ovate-lanceolate, cuspidate; upper leaves ovate, cuspidate, more or less spreading, twisted when dry, entire, margin reflexed, nerve excurrent; capsule obconical, large, subpendulous; lid apiculate. (TAB. XLIX.)

Bryum torquescens *Br. and Sch.* Monogr. p. 49. t. 20.

Hab. On rocks and walls; rare, or frequently overlooked as a state of *B. capillare.* Gormire, 1844, *W. Borrer, Esq.* Near Hurst Pierpoint, Sussex, *Mr. Mitten.* Near Tonbridge Wells, *Mr. Jenner.* Fr. June, July.

Stems $\frac{1}{4}$—1 inch long, branched; fertile branches short, sterile ones slender and elongated. Leaves more or less spreading, slightly twisted when moist, evidently contorted when dry, as in the more lax varieties of *B. capillare;* lower leaves widely lanceolate, terminal ones ovate or obovate, not longer than the rest, sometimes serrulate at the apex, concave; margin reflexed, the marginal cellules narrow; nerve excurrent as a bristly point. Fruitstalk $\frac{1}{2}$—2 inches long, reddish, arcuate at the summit. Capsule drooping, rarely quite pendulous, clavate-obconical, usually incurved, reddish-brown, the neck gradually tapering into the fruitstalk. Lid convex, apiculate, purplish-red, glossy. Annulus dehiscent.

In habit, and in the foliage, this moss approaches to *B. capillare;* but the capsule is very like that of *B. obconicum.* From the first it differs in the narrower and more lanceolate terminal leaves, and from both in the synoicous inflorescence. The large obconical capsule, and the twisted leaves, are the chief marks by which it may be distinguished from *B. intermedium* and the allied species. It appears to prefer a warmer climate than that of Britain, and is frequent in the South of Europe, and in New Holland.

c. Inflorescence dioicous.

245 - 22. *Bryum obconicum* Hornsch. (*obconical Thread-Moss*); dioicous; stem with branch-innovations; leaves ovate, oblong-ovate, acuminate, concave, carinate above, entire, not twisted when dry, margin recurved, nerve excurrent; capsule more or less pendulous, clavate, long-necked; lid mammillate. (TAB. XLIX).

Bryum obconicum *Hornsch. MS. Br. and Sch.* Monogr. p. 59. t. 27.

Hab. On walls near Barnard Castle, June 1843, *Mr. Spruce:* rare. Fr. June, July.

In habit and size this is intermediate between *B. capillare* and *B. cæspiticium*, resembling the latter very much in the mode of innovation, and in the clustered terminal leaves, which, as in that species, are erect when dry and not twisted. It is readily known by the long-necked, narrowly obconical, symmetrical capsule, which when dry has a polished cartilaginous border composed of smaller cellules than the rest of the capsule, which, according to Bruch and Schimper, is of a dark reddish colour when fully ripe, at length blackish. Lid bright red. The leaves are never obovate, as in *B. capillare*, and are more gradually acute than in that; the margin not thickened, as in *B. Donianum*, which it resembles in the peristome.

246 23. *Bryum capillare* Hedw. (*greater matted Thread-Moss*); dioicous; leaves more or less spreading, strongly contorted when dry; lower leaves ovate-oblong, apiculate; terminal leaves larger, obovate-oblong, with long slender points, nerve ceasing below the apex or excurrent; capsule subpendulous, oblong-pyriform, clavate or obovate; lid apiculate. (Tab. XXIX.)

Bryum capillare *Hedw.* Sp. Musc. p. 182. *Schwaegr.* Suppl. t. 74. *Turner. Smith,* Eng. Bot. t. 2007. *Bridel. Swartz. Hook. and Tayl.* (ex parte). *Br. and Sch.* Monogr. p. 60. t. 28, 29. (Hypnum *Web. and Mohr.*)

Bryum annotinum *Smith,* Fl. Brit. (partly). Eng. Bot. t. 1682. (the large specimen with fruit). *Dill.* Musc. t. 50. f. 67. (and see t. 52. f. 78.)

var. β. majus; more densely tufted; stem longer; leaves broader, with broader more evident border, nerve excurrent; capsule larger, thicker, reddish.

B. capillare γ. macrocarpon *Huebener.*

var. γ. minus; leaves concave, imbricated; sterile branches roundish; capsule smaller.

var. δ. flaccidum; with slender branches; leaves more tender, pale, lower ones purplish, spreading, flaccid, not contorted nor twisted when dry, more evidently serrated at the apex.

Bryum flaccidum *Bridel.*

Bryum stellare *Smith,* Eng. Bot. t. 2434.

B. andicola *Humboldt. Kunth.* Syn. Pl. Æquinoct. 1. p. 58. *Bridel.*

var. ε. Ferchelii; compactly tufted; stem and branches slender; leaves smaller, obovate-acuminate, concave, subpiliferous, reddish; capsule smaller, obovate, at length truncate, constricted below the mouth.

B. Ferchelii *Funck. Bridel.*

var. ζ. carinthiacum; stem elongated, slender, with slender branches; leaves erecto-patent, slightly twisted when dry, reddish, obovate, rather broad, shortly acuminate, obscurely bordered.

var. η. cochlearifolium; branches roundish; leaves very concave, roundish, glossy, with narrow reflexed points; capsule obovate-pyriform, pendulous; fruitstalk thicker.

B. capillare β. cochlearifolium *Bridel.*

B. elegans *Nees ab Esenb. Bridel.*

Hab. On walls, rocks, trunks of trees, &c., frequent.
Fr. May.

Stems ¼—1 inch long, with innovations, radiculose below, sparingly branched at the base, or at the flowering summit. Leaves more or less spreading, closely contorted when dry; upper leaves slightly obovate, with long narrow points, so as to be almost piliferous, more or less concave, the margin reflexed, composed often of narrower cellules than the rest of the leaf, which thus sometimes, but not constantly, appears to be bordered, entire, or sometimes serrulate at the apex; nerve either ceasing below the apex, or excurrent. Capsule more or less pendulous, or drooping, variable in shape, usually oblong-pyriform, or subclavate, scarcely constricted below the mouth when dry, reddish-brown; outer teeth reddish-brown; inner peristome deeply coloured, less deeply divided than in *B. cæspiticium.* Lid reddish, shining, apiculate. Spores green, small.

This is one of the most common species, varying much in size and general aspect, but may usually be known by the obovate, abruptly narrow-pointed leaves, which are strongly contorted when dry. The form assumed as the type by Schwaegrichen and the authors of the *Bryologia Europæa*, is one which grows in shady places in forests: the most common form in Britain is that growing upon walls, here considered as the var. *β. majus*, which has larger capsules, and the nerve of the leaf usually excurrent. The border of the leaf is never thickened in this species, but is merely composed of narrow cellules. Var. *flaccidum* grows on moist rocks, in warm situations. The other varieties are of more or less alpine growth.

Bryum platyloma of Schwaegrichen, *Suppl.* t. 76., is probably a variety of *B. capillare*, with the leaves widely margined. Specimens almost exactly corresponding with Schwaegrichen's figure, from Mr. Winch, are in *Herb. Turner*, under the name of *Tortula pilosa* Schrad.

47 24. *Bryum Donianum* Greville (*Don's Thread-Moss*); dioicous; stem radiculose, branched, with innovations; leaves spreading, slightly crisped and twisted when dry, ovate-oblong, with a narrow thickened border, subserrated at the apex, nerve scarcely excurrent; capsule conico-clavate, subpendulous; lid apiculate. (TAB. XLIX.)

B. Donianum *Greville*, in Lin. Trans. vol. 15. p. 345. t. 3. f. 6.
B. platyloma *Bruch and Schimp.* Bryol. Europ. Monogr. p. 58. t. 26. *C. Müller*, Syn. Musc. ii. 751. (not *Schwaegr.* Suppl. t. 76. nor *Bridel*).
B. corsicum *Arnott*, in Herb. Requien.
B. capillare δ. corsicum *Brid.* Bryol. Univ. i. 849.
B. Muelleri *Spruce MSS.*
B. marginatum *Lucas? Bridel?* Bryol. Univ. i. 849.

Hab. On rocks, and on sandy banks; rare. Winwick Stone Quarry, near Warrington, and near Conway, N. Wales, *W. Wilson.* Damp sand-bank near Hurst Pierpoint, Sussex, *Mr. Mitten.* In fruit near Winchelsea, Sussex, *Mr. E. Jenner.*

In aspect not unlike *B. capillare*, but the leaves are scarcely obovate, with very short points, formed by the scarcely excurrent nerve, and are by no means suddenly attenuated and subpiliferous as in that species; they are indeed much more like those of *B. pallens*, which has also the border thickened, though much less conspicuously so than in this species, and when dry they are not contorted as in *B. capillare*, but only crisped and slightly twisted, or undulated: they are of somewhat firmer texture than in the allied species, of a green colour, never reddish. Capsules long and clavate, contracted below the mouth when dry, not unlike those of *B. obconicum*, pale reddish-brown.

B. platyloma of Schwaegrichen, *Suppl.* t. 76., is probably nothing more than a state of *B. capillare;* the leaves are represented with a very broad but not thickened border, and the nerve is very much excurrent; the capsule not at all different from what is usually present in *B. capillare.* We have not seen any authentic specimen of *Bryum marginatum* of Bridel, found in Alpine bogs, in Switzerland, but his description very much corresponds with our moss, and we strongly suspect that they are the same.

247.* 24*. *Bryum Billarderii* Schwaegr. (*La Billardiere's Thread-Moss*); dioicous; stem radiculose, branched, with short innovations; leaves crowded into whorls, erecto-patent, undulated when dry, ovate-oblong, concave, serrulate, recurved at the apex, nerve more or less excurrent; capsule obconic-pyriform, pendulous; lid conic-apiculate. (TAB. L.)

Bryum Billarderii *Schwaegr.* Suppl. t. 76. *Bridel,* Bryol. Univ. *Bruch and Schimp.* Bryol. Europ. fasc. 6—9. p. 58. t. 26.

B. canariense *Schwaegr.* Suppl. t. 214. f. 2. (as to the specimen from the Cape of Good Hope.)

Hab. Woolsonbury Hill, near Hurst Pierpoint, on old ant-hills; barren. Fr. Summer.

Stems ½—1 inch long, radiculose below, interruptedly leafy, the leaves crowded into dense tufts at the ends of the stems and innovations. Leaves suberect, with recurved summits, concave, rather rigid, not twisted when dry, but undulated or slightly crisped, pale or yellowish-green, distinctly serrulate, the margin recurved in the lower part; nerve strong, green, shortly excurrent in Schwaegrichen's plant, much excurrent in our specimens, and forming a spinulose recurved point to each leaf; areolæ rather large and pellucid. Capsule intermediate in form between those of *B. obconicum* and *B. capillare.*

B. canariense Schw. *Suppl.* t. 214. f. 1., according to an original specimen from Dr. Taylor, has leaves of firmer texture, appressed and not undulated when dry, not recurved at the summit, more minutely serrulate, or denticulate; areolæ smaller and more opaque; nerve opaque, very shortly excurrent into a smooth mucro.

B. campylothecium of Dr. Taylor, from Swan River, is a compound. His description, as to the leaves, refers to *B. Billarderii.* The moss really intended has leaves not at all margined, wider and somewhat obovate, appressed, and scarcely at all altered (not undulated) when dry, nerve much excurrent; capsule ventricose-pyriform, curved, with a small mouth, pale brown.

B. truncorum of Bridel is allied, but has a short pyriform capsule, and more rigid obovate leaves, approaching *B. roseum.*

248. 25. *Bryum cæspiticium* Linn. (*lesser matted Thread-Moss*); dioicous; cæspitose; stems with branches and innovations, radiculose; leaves more or less spreading, erect and straight when dry, ovate-acuminate, or ovate-lanceolate, nerve excurrent, margin reflexed, not thickened; capsule pendulous, oblong-obovate, slightly constricted below the mouth when dry; lid large, mammillate. (TAB. XXIX.)

Bryum cæspiticium *Linn.* Sp. Pl. 1586. *Hedw. Turner. Smith,* Eng. Bot. t. 1904. *Funck,* Deutsch Moose, t. 29. f. 12. *Schwaegr. Bridel. Hook. and Tayl.* (ex parte). *Br. and Sch.* Monogr. p. 70. t. 34, 35.

Hypnum cæspiticium *Weber and Mohr. Dill.* Musc. t. 50. f. 63. A. B. C. E. (fide *Hook. and Arn.*)

var. β. gracilescens; sterile branches slender; leaves narrower, erect; capsule short, chestnut coloured; lid more convex.

Bryum badium *Bruch,* in *Bridel,* Bryol. Univ.

var. γ. imbricatum; with numerous sterile roundish branches; leaves imbricated, concave, broad, cuspidate, yellowish, glossy.

Bryum Kuntzii *Hoppe and Hornsch.*

Hab. On walls, and rocks, also on the ground, on roofs, &c.
Fr. May, June.

Growing in more or less compact tufts of a yellowish or intense green. Stems from 2 lines to 1 inch long, with innovations, and also with sterile branches, which are at times slender and not much unlike those of *B. julaceum.* Leaves erecto-patent, the terminal ones larger than the rest, all of them erect and straight when dry, ovate-acuminate, or ovate-lanceolate, cuspidate, margin reflexed, nerve more or less excurrent beyond the entire or serrulate apex. Capsule variable in shape, usually oblong-obovate, sometimes pyriform or oval, slightly constricted when dry, reddish-brown, paler and smaller than that of *B. capillare,* with a yellow (not red) lid, and paler peristome. Spores yellow, small.

If due attention be paid to the leaves, no difficulty will be experienced in distinguishing this from *B. capillare.* In the leaves it is a miniature resemblance of *B. cernuum,* from which it may always be known by the large mouth of the capsule, large mammillate lid, and perfectly formed inner peristome, as well as by the dioicous inflorescence. Some of the almost innumerable varieties are with difficulty identified with this species, and require to be carefully studied.

9. 26. *Bryum sanguineum* Ludwig, Bridel (*bloody Thread-Moss*); dioicous; stem short; leaves erecto-patent, ovate-lanceolate or lanceolate, cuspidate, entire or serrulate at the apex, margin scarcely reflexed, nerve shortly excurrent; capsule pendulous, oblong-pyriform; lid apiculate. (TAB. L.)

Bryum sanguineum *Bridel,* Mant. Musc. p. 118. Bryol. Univ. i. 671.

Bryum erythrocarpon *Schwaegr.* Suppl. t. 70. (not *Bridel,* Bryol. Univ. i. 654.) *Funck,* Deutsch. Moose, t. 29. f. 12. *Br. and Sch.* Monogr. p. 72. t. 36.

B. bicolor *Dickson. Turner,* Musc. Hib. (omitting the fig. t. 11. f. 2. which is *B. lacustre*). *Smith,* Eng. Bot. t. 1601. (var. with short capsule).

var. β. radiculosum; larger; capsule oblong-obconical; fruitstalk geniculate at the base.

B. radiculosum *Bridel,* Bryol. Univ.

Hab. On the ground in heathy places, and on walls. Var. *β.* in more moist situations. Fr. June, July.

Growing in depressed, incoherent, more or less extended patches. Stems 2—4 lines long, with branches more or less elongated. Leaves mostly lax and scattered, erecto-patent, erect and straight when dry, narrower than in the next species, the margin almost plane, nerve more excurrent, apex usually serrated, less concave. Fruitstalk about 1 inch long, longer than in the next species. Capsule oblong, or pyriform, the neck gradually tapering into the fruitstalk, slightly constricted below the mouth when dry, deep blood-red when fully ripe. Lid usually more pointed than in the next species.

This species and *B. atropurpureum* are very nearly connected by intermediate forms, so ambiguous in character that we are doubtful to which species they should be referred; and we do not know of any character by which to distinguish them except those above given.

350. 27. *Bryum atropurpureum* Web. and Mohr. (*dark-purple Thread-Moss*); dioicous; stem short, branched; leaves erecto-patent, erect and appressed when dry, ovate-lanceolate or ovate, concave, margin reflexed, nerve subexcurrent; capsule oval, or oval-oblong, constricted below the lid. (TAB. L.)

Bryum atropurpureum *Web. and Mohr,* Ind. Musc. *Br. and Sch.* Monogr. p. 73. t. 37.

Bryum erythrocarpon *Bridel,* Br. Univ. i. 654. (not *Schwaegr.* nor *Br. and Schimp.*)

B. carneum *β.* pusillum *Schultz.*

B. pulchellum *β.* atropurpureum *Wahlenb.* Fl. Lap. *Schwaegr.*

B. bicolor *Turner,* Musc. Hib. (partly) according to Herb. Turner.

B. cæspiticium *Hook. and Tayl.* (ex parte). *Dill.* Musc. t. 50. f. 66. F. G.

Hab. On banks, walls, &c. with *B. argenteum.* Fr. May.

Smaller than *B. cæspiticium;* the leaves more concave, less acuminate, and more shortly pointed, the margin less evidently reflexed, wider and more crowded than in the preceding species, somewhat glossy, entire, lower ones often reddish; fruitstalk shorter, arcuate at the top. Capsule oval or oblong, not pyriform, the neck or apophysis not tapering, but abruptly passing into the fruitstalk, though less tumid and abrupt than in the nearly allied Indian species *B. coronatum*, and not unlike that of *B. argenteum;* deep red or purplish when ripe. Lid large, less pointed than in the preceding species, always wider than the mouth of the capsule, which thus appears constricted, even when unripe. Bridel's older name *erythrocarpon*, is less apposite than *atropurpureum*, and has been applied by Schwaegrichen and others to designate another species: we have therefore thought it best, in order to avoid confusion, to retain the name given by Weber and Mohr.

Bryum gracilentum Taylor MS. is nothing more than a gemmiparous state of *B. atropurpureum*, with elongated stems, growing in dense soft tufts of a lively green colour. In this state it is more common near Warrington than with capsules, and the leaves have the nerve mostly discontinued below the apex; but this is by no means a constant character, and it is not difficult to find examples in the same tuft where the nerve is as decidedly excurrent as in the typical form of the species. The gemmæ are analogous to those of *B. annotinum*, but usually more abundantly clustered in the axillæ of the younger leaves, and more quickly deciduous.

The allied species *B. versicolor* Braun, Br. & Sch., differs from *B. atropurpureum* in having the fruitstalk sharply and suddenly bent at its junction with the tumid neck of the capsule, as in *B. coronatum*, to which it is most closely allied, if indeed it be not a variety of that species.

59.— 27*. *Bryum apiculatum?* (*pointed Thread-Moss*); leaves erecto-patent, erect when dry, elliptic-lanceolate, concave, nerved to the apex. (Tab. L.)

Bryum apiculatum *Schwaegr.* Suppl. t. 72.?

Hab. Abundant on Slemish Mountain, county Antrim, Ireland; growing in large tufts, all barren, *Mr. D. Moore.*

The specimens being barren, we cannot determine this moss. It may even be an alpine barren state of *B. sanguineum;* but differs from the typical form of that species in the elongated densely tufted stems, and more crowded entire leaves of firmer texture, bright glossy green, the margin scarcely if at all reflexed, and the nerve not excurrent. *B. Sauteri* of Bruch and Schimper is similar, but has reddish leaves and the nerve excurrent. The original specimen of *B. apiculatum*, figured by Schwaegrichen, is lost; but in the Herbarium of Prof. Arnott there is a specimen from Achille Richard, marked "Isle de France," which is probably a duplicate of Schwaegrichen's moss. This has the leaves more membranous than the Irish specimens, with larger cellules, and reddish nerve, and may perhaps be the same species as *B. cellulare* Hooker (Schwaegr. *Suppl.* t. 214. a., which is also *Pohlia turbinata* Schwaegr. *Suppl.* t. 194.), or at least is very closely allied to that moss, as it is also to *B. pachypoma* Montagne, and to *B. nitens* Hook., which all require to be very minutely compared in order to determine whether they belong to one or to different species: compare also *B. semiovatum* Bridel, *Br. Univ.* i. 846. To this group also belongs *B. marginatum* Br. & Schimp., *Monogr.* p. 74. t. 38., which seems to differ only in the more dwarfish robust habit and wider leaves, with a coloured not thickened border: but this character is not always evident, even in the same individual; hence we consider *B. marginatum* to be a doubtful species. *Bryum Funkii* Schwaegr., Br. & Sch. *Monogr.* p. 77. t. 40., has still wider, more concave leaves, and is not unlike *B. cæspiticium var.* β., from which it differs in having the margin of the leaf plane, not reflexed, the nerve less excurrent, and the areolation more lax, approaching in habit to *B. julaceum* and *B. argenteum*. *Bryum Blindii* Br. & Sch. *Monogr.* fasc. 32. t. Suppl. 12., differs from *B. Funkii* in the roundish-pyriform, dark purplish-red capsule, on a pedicel suddenly bent at its junction with the neck of the capsule, and in its habit approaching nearer to the next species.

SECT. V. *Leaves very concave, closely imbricated; nerve mostly ceasing below the apex.*

* Capsule symmetrical.

251. 28. *Bryum julaceum* Smith (*slender-branched Thread-Moss*); dioicous; cæspitose; stem elongated, slender; branches unequal, filiform; leaves closely imbricated, ovate, concave, entire, margin not reflexed, nerve ceasing below the apex; capsule drooping, oblong-obovate, subpyriform, pale; lid mammillate; peristome small. (TAB. XXVIII.)

Bryum julaceum *Smith,* Fl. Brit. p. 1357. Eng. Bot. t. 2270. *Hook. and Tayl. Schwaegr.* Suppl. t. 195. *Bridel,* Bryol. Univ. (ex parte). *Bruch and Schimp.* Monogr. p. 79. t. 40.

Bryum filiforme *Dickson.*

B. argenteum β. *Linn.* Sp. Pl. *Dill.* Musc. t. 53. f. 63. D. *Schwaegr.*

Hypnum argenteum β. *Mohr.*

var. β. *concinnatum;* stems shorter, more slender; leaves apiculate, nerve thin, slightly excurrent, apiculus recurved.

Bryum concinnatum *Spruce,* in Musci Pyren. n. 121

Bryum nimbigenum *Tayl. MS.*

Hab. In wet places on rocks, &c., in alpine and subalpine situations; rare in fruit. Var. β. Knockavohila, near Kenmare, Ireland, *Dr. Taylor.* Caldron Snout, Teesdale, *Mr. Spruce.* Ochills, *Mr. Lyle;* barren. Fr. Aug. Sept.

Growing in incoherent, bright green, shining patches. Stems not radiculose, 1—3 inches long, slender, with filiform branches varying in length. Lower leaves widely elliptical, upper leaves gradually larger, all of them suberect, imbricated, concave, entire, rather obtuse, the margin not recurved, nerve ceasing below the apex; areolæ narrow, larger towards the base. Fruitstalk about an inch long, arcuate at the summit. Capsule more or less drooping, oblong, or oval-oblong, pale reddish-brown when ripe, not constricted below the mouth when dry. Lid convex, with a small point.

Bruch and Schimper remark that the moss described by Schrader, under the name of *B. julaceum*, is only a luxuriant variety of *B. argenteum*, and that even Bridel has misunderstood the true

British species, as is evident by the synonyms and localities which he indicates. From *B. argenteum* this species is easily known by the glossy yellowish-green colour of the leaves, which are not discoloured nor diaphanous at the summit, and are of firmer texture; also by the oblong, narrow, subpyriform capsule, and by the arcuate summit of the fruitstalk. It is usually found by the sides of streams, in mountainous situations.

The var. β. has the nerve of the leaf slightly excurrent, forming a short reflexed point, and may possibly be a different species; but we have seen only barren specimens (compare *B. semiovatum* Brid. *Br. Un.* i. 846.): those sent by Dr. Taylor grew intermixed with *Zygodon Mougeotii.*

252. 29. *Bryum argenteum* Linn. (*silvery Thread-Moss*); dioicous; cæspitose, stem branched; branches julaceous; lower leaves scattered, broadly ovate, apiculate; upper leaves imbricated, ovate-lanceolate; all of them concave, entire, loosely reticulated, nerve ceasing below the apex; capsule pendulous, oval-oblong; lid mammillate. (Tab. XXIX.)

Bryum argenteum *Linn.* Sp. Pl. p. 1586. *Hedw. Schwaegr. Turner. Smith,* Eng. Bot. t. 1602. *Funck,* Deutsch. Moose, t. 29. f. 1. *Bridel. Hook. and Tayl. Bruch and Schimp.* Monogr. p. 78. t. 41.

Hypnum argenteum *Web. and Mohr. Dill.* Musc. t. 50. f. 62.

var. β. majus Schwaegr.; stem elongated; leaves almost destitute of points, greenish.

Bryum julaceum *Schrader,* Spic. Fl. Germ.

var. γ. lanatum; more densely tufted; leaves with longer points, destitute of chlorophyll, silvery white.

Bryum lanatum *Bridel.*

Hab. On the ground, by way-sides, &c.; on roofs and walls.
Fr. Oct., Nov.

Growing in silvery white patches. Stems ¼—1 inch long, slender and fragile. Leaves imbricated, broadly ovate, mostly apiculate, the points more or less reflexed and colourless, very concave, entire, margin not recurved, areolæ lax, nerve ceasing considerably below the point. Fruitstalk usually about half an inch long, rather suddenly bent near its junction with the capsule, which is oval-oblong, its neck not tapering, but abruptly passing into the fruitstalk, of a purplish or reddish colour when ripe, and constricted below the mouth when dry. Lid convex, obscurely pointed.

The var γ. *lanatum* is peculiar to warm climates, and is found at the Cape of Good Hope, in N. and S. America, and in New Holland. Var. β. grows in moist shady places.

** Mouth of the capsule oblique.

53. 30. *Bryum Zierii* Dicks. (*Zierian Thread-Moss*); dioicous; stem short, with short innovations; branches julaceous; leaves ovate-acuminate, imbricated, concave, entire, reticulated, nerve

ceasing below the apex; capsule clavate, subpyriform, cernuous, incurved, gibbous at the back, mouth oblique; inner peristome longer than the outer, with very short imperfect cilia. (Tab. XXIX.)

Bryum Zierii *Dickson*, Crypt. Fasc. 1. t. 4. f. 10. *Hedw.* Sp. Musc. t. 44. f. 1—4. *Turner.* *Smith*, Eng. Bot. t. 1021. *Funck*, Deutsch. Moose, t. 29. f. 2. *Bridel.* *Hook. and Tayl.* *Bruch and Schimp.* Monogr. p. 30. t. 9.

Pohlia Zierii *Schwaegr.* in *Lin.* Sp. Pl.

Hab. Mountains of England, Scotland, and Ireland, in crevices of rocks. Fr. Oct., Nov.

Growing in rather lax, soft, pale or silvery-reddish tufts. Stems ½—1 in. long, the branches julaceous, whitish above, reddish below, shining, somewhat resembling *B. argenteum* in aspect, but larger, and always with a considerable tinge of red. Leaves roundish-ovate, acuminate, very concave, imbricated, entire, of thin membranous texture, loosely reticulated, margin not reflexed, nerve ceasing below the apex, which is slightly recurved; lower leaves reddish; upper leaves longer and narrower, with the nerve extending nearer to the apex. Fruitstalk scarcely half an inch long, arcuate at the top. Capsule large, clavato-pyriform, gibbous on the upper side, with a very long, tapering, incurved neck, its mouth oblique, enlarged after the dispersion of the spores; it is of a reddish-brown colour, and more or less cernuous. Lid small, conical, acute. Annulus spirally dehiscent. Cilia of the inner peristome rudimentary, or absent. Spores rather large, brownish.

The large singular capsule of this species, and the vinous red tint of the foliage, will prevent its being confounded with *B. argenteum*. In the form of the capsule, this and the following species are allied to *Meesia*.

254. 31. *Bryum demissum* Hooker (*club-fruited Thread-Moss*); dioicous; stem short; leaves ovate, cuspidate-acuminate, reticulated, margin recurved, nerve mostly excurrent; perichætial leaves lanceolate, with longer points; capsule cernuous, incurved, clavate-pyriform, somewhat gibbous; the mouth small, oblique; inner peristome longer than the outer teeth. (Tab. XXXVI.)

Bryum demissum *Hooker*, Musci Exotici, t. 99. *Greville*, Scot. Crypt. Fl. t. 92. *Br. and Sch.* Monogr. p. 31. t. 9.

Meesia demissa *Hoppe and Hornsch.* *Bridel.* *Schwaegr.* Suppl. t. 233.

Pohlia demissa *Huebener.*

Hab. Near the summits of the Breadalbane Mountains, Scotland; in the fissures of rocks, in exposed situations; rare. Fr. August, Sept.

Growing in reddish tufts. Stems scarcely ⅓ inch long, radiculose, with short innovations and branches. Lower leaves ovate-acuminate, the nerve often ceasing below the apex; upper leaves more pointed, the nerve excurrent, margin recurved: all of them erecto-patent, erect and straight when dry, reddish, entire. Fruitstalk ½ inch long or more, arcuate above like a swan's neck. Capsule very similar to that of the preceding species, the neck rather shorter, and the mouth more oblique; inner peristome proportionably longer, its segments more irregular, and variously united, cilia short, mostly solitary. An annulus is present.

This is known from the preceding by its more compact dwarfish tufts, and by the foliage, which (except in colour) is not unlike that of *B. cæspiticium*.

From the genus *Meesia*, with which Bridel endeavoured to unite it, Bruch and Schimper remark that it differs essentially in the cellular tissue of the leaves, the inflorescence, the hygrometric teeth of the outer peristome incurved when dry, and in the basilar membrane of the inner peristome surmounting the orifice of the capsule, to which analogous forms are presented in *B. uliginosum*, *pallens*, &c.

SECT. VI. *Leaves broad, roundish* (allied to *Mnium*).

255. 32. *Bryum Tozeri* Greville (*Mr. Tozer's Thread-Moss*); dioicous; stems gregarious, short; lower leaves remote, narrowly obovate; upper leaves widely obovate, apiculate; all more or less bordered, loosely reticulated, entire, nerved half way; capsule subpendulous, oval-pyriform; lid conical. (TAB. L.)

Bryum Tozeri *Greville*, Scot. Crypt. Fl. t. 285. *Hooker*, in Eng. Fl. *Br. and Sch.* Monogr. p. 41. t. 16. (Mniobryum.)
Bryum melanodon *Bridel*, according to *Bridel*. See Bryol. Univ. Addenda.
Bryum marginatum *Bruch MS.*

Hab. On shady banks, &c., by the sides of rivulets. By the River Dart, Devonshire, *Rev. Mr. Tozer*. Cornwall, *Mr. Ralfs*. Near Torquay, *Miss Griffiths*. Henfield, Sussex, *W. Borrer, Esq.* Near Hurst Pierpoint, *Mr. Mitten*. By the River Lee, above Cork, Ireland, *Mr. D. Moore*. Swanscombe Wood, Kent (with barren flowers), *Rev. C. A. Johns*. Rare in fruit. Fr. March, April.

In size and general appearance this very much resembles *B. carneum*, but has wider, roundish-ovate, apiculate leaves, with a more or less distinct coloured border. Stem 4—6 lines long, reddish, mostly simple, rarely producing innovations from the floral apex. Lower leaves distant, upper ones more crowded, larger, roundish, or obovate-acuminate, narrow at the base, entire, with a coloured but not thickened border, the reddish nerve ceasing much below the apex; lower leaves especially tinged with vinous-red, the reticulation large and distinct. The leaves of the barren-flowered plant frequently exhibit a trifarious arrangement and oblique insertion, the leaves of one row being smaller, resembling stipules, and the nerves of the other leaves not exactly in the middle. Barren flower gemmiform. The outer perigonial leaves somewhat spreading and unequal in size. Antheridia mixed with longer filiform paraphyses. Fruitstalk geniculate at the base, curved at the summit, reddish. Capsule more or less drooping or pendulous, obovate or pyriform, somewhat ventricose, scarcely constricted below the mouth when dry, reddish. Annulus adherent to the margin of the lid, which is conical and sometimes apiculate. Outer peristome reddish-brown, paler than in *B. carneum.* Inner peristome with short solitary cilia, occasionally wanting. Spores small, reddish-brown.

This very beautiful and distinct species is one of the rarest of the genus, and is found in Sardinia. It has been supposed to be the same as *Mnium rubellum* of P. Beauvois; but an original specimen of that moss in Professor Arnott's Herbarium, gathered in Pennsylvania, is essentially different, and agrees well, except in its smaller size, with *Bryum dichotomum* Hedw. *Sp. Musc.* t. 42. (from New Zealand), and probably belongs to the same species, being closely allied to *Bryum sanguineum* Bridel in the leaves, but the capsule is short and roundish, and more like that of *B. atropurpureum*, wanting, however, the constriction and the dark colour which is so obvious in that species. A specimen corresponding with *Mnium rubellum* P. Beauv. was sent by Mühlenberg from Pennsylvania, marked "*Bryum carneum*, No. 83." (*v. Herb. Arnott.*), and is probably a duplicate of P. Beauvois' original specimen, which was received from Dr. Mühlenberg.

Two species referrible to this section, but not found in Britain, deserve some notice in this place. *Bryum cyclophyllum* Br. and Sch., according to the structure of the barren flower, if truly represented by Schwaegrichen (see *Mnium cyclophyllum* Schwaegr. *Suppl.* t. 194.), would appear to belong to the genus *Mnium;* or, as Bruch and Schimper remark, it forms an intermediate link between these two genera. *Bryum latifolium* Br. and Sch., with monoicous inflorescence, but otherwise similar to *B. cyclophyllum*, is already described under another name, and is *Bryum calophyllum* R. Brown; this also approaches in habit to *Mnium*, but the paraphyses of the barren flower are filiform, and in the capsule and peristome it agrees with *Pohlia.*

Sect. VII. *Leaves very large, collected into a terminal, spreading, rosaceous tuft.*

236 33. *Bryum roseum* Schreb. (*rosaceous Thyme Thread-Moss*); dioicous; stem decumbent at the base; lower leaves small, erect, lanceolate; upper leaves very large, crowded into a spreading rosaceous tuft, spathulate-apiculate, serrated above, margin recurved, nerved almost to the apex; fruitstalks aggregate; capsules pendulous, oblong, slightly incurved; lid mammillate. (Tab. XXIX.)

Bryum roseum *Schreb.* Spic. Fl. Lips. 84. *Bridel. Roth. Turner. Smith,* Eng. Bot. t. 2395. *Br. and Sch.* Monogr. p. 56. t. 25.
Mnium roseum *Hedwig. Schwaegr. Funck,* Deutsch. Moose, t. 32. f. 13.
Bryum Polla rosea *Bridel,* Bryol. Univ.
Hypnum roseum *Web. and Mohr. Dill.* Musc. t. 52. f. 77.

Hab. Shady banks, chiefly in a sandy soil; rare in fructification. In fruit near Meavy, Devonshire, *Rev. J. S. Tozer.* Near Manchester, *Hobson.* Near Over, Cheshire, *W. Wilson.* Near Cork, Ireland, *Mr. James Drummond.* Fr. Nov., Dec.

A large, very handsome species, with stellated terminal clusters of leaves, somewhat resembling an expanded rose. In habit it nearly approaches to the genus *Mnium*, but the innovations are produced in the same mode as in *Bryum*, and the tissue of the leaves, the inflorescence, and the structure of the peristome are likewise conformable. The stems are 1—4 inches long, branched below the surface of the ground; the lower leaves very small and inconspicuous, appressed, somewhat decurrent; upper leaves widely spreading, slightly recurved, spathulate-apiculate, flattish, the margin recurved in the lower part, not thickened, serrated in the upper half; nerve mostly ceasing below the recurved apex. Barren flower spreading, almost discoid, with numerous antheridia mixed with filiform, not clavate, paraphyses. Fruitstalks ½—2 inches long, often 2 or more together. Capsule mostly pendulous, large, clavate-oblong, or subcylindrical, slightly curved, short-necked, tapering into the fruitstalk, reddish-brown. Lid reddish, shining, convex, with a short point. Annulus large, spirally dehiscent.

This is the largest of the species indigenous to Europe; but a still larger species, *Bryum giganteum* Hook., is found in the East Indies, differing essentially from our moss in its doubly-spinous serratures.

Bryum truncorum of Bridel, a little-understood species, appears to be very closely allied to *B. roseum.* We have numerous forms of this and perhaps other allied species from Van Diemen's Land, which seem to present a series of transitions from *B. roseum* to *B. Billarderii;* and Bruch and Schimper remark that there are small states of *B. roseum* from N. America which very much resemble the larger varieties of *B. capillare*, from which, however, it essentially differs in the form and serrature of the leaves.

[*Bryum obtusifolium* Turner (*Musc. Hib.* p. 116. t. 11. f. 1.) is a mixture of *Hypnum palustre* (as to the capsule), and of *Didymodon luridus* (as to the leaf), growing together.]

52. MNIUM *Br. and Sch.* Thyme Thread-Moss.

BRYUM (partly) *Hook. and Tayl.*
POLLA *Bridel.*

Gregarious or cæspitose, perennial, the most elegant of the *Bryeæ*, conspicuous for their large size and broad leaves: they are among the largest of acrocarpous mosses, growing on the ground or on rocks in shady situations.

Stem erect or decumbent, somewhat creeping, mostly with long, sterile, flagelliform, more or less prostrate, branches, rooting at the extremity, or, in other words, the species are stoloniferous; *innovations* from the lower part, seldom from the flowering apex, of the fertile stem, in which respect there is usually but not invariably a marked difference between the species of this genus and the true *Brya.*

Leaves varying much in shape and disposition, often very large, roundish-elliptical, spathulate, ligulate, or more or less lanceolate, with a cartilaginous, sharply spinuloso-serrated border; in some species the serratures are composed of a double row of spines, in other species the leaves are entire, and in some the cartilaginous border is wanting; *areolæ* roundish-hexagonal, rather large, often radiating from the nerve to the circumference of the leaf; *nerve* extending to or sometimes beyond the apex of the leaf, sometimes ceasing below it.

Inflorescence terminal, dioicous, or synoicous. *Barren flowers* discoid; the others gemmiform; *paraphyses* of the barren flowers clavate, more shortly articulated above; *antheridia* numerous. *Fertile flowers* with filiform paraphyses.

Capsules frequently aggregate, on long fruitstalks, pendulous or drooping, oval or oblong, not pyriform, scarcely apophysate, more abruptly terminating at the base than in *Bryum*, the sporangium filling up the cavity to the base. *Lid* convex at the base, sometimes rostrate and long, sometimes with a very small apiculus only, sometimes short and obtuse. *Annulus* compound, spirally unrolling on the fall of the lid. *Peristome* double; *outer teeth* 16, very hygroscopic, lanceolate, tapering, with strong, prominent, transverse trabeculæ on the inner side, as in *Bryum;* they are generally pale yellow or reddish-brown; *inner peristome* a membrane usually orange and more deeply coloured than the teeth, divided half-way down into 16 carinate processes (mostly perforated or lacunose in the middle), with intermediate appendiculate cilia two or three together. *Calyptra* small, cucullate, pale or reddish. *Spores* small, greenish or reddish brown.

Bruch and Schimper justly remark that, if the peristome only be assumed as the foundation for a genus, it will be necessary to unite *Bryum* with *Mnium;* but that, in accordance with the natural method of arrangement which takes into account the whole assemblage of characters presented by all parts of the plant, we are then led to admit the necessity of separating these into two genera, the *Mnia* having a remarkable habit by which they are easily distinguished from *Bryum.* In the mode of innovation it is true that anomalies sometimes occur, as in the case of *Mnium subrotundum*, which occasionally presents the character of *Bryum*, and in another allied species; but the difference of habit, the clavate paraphyses of the barren discoid flowers, the large dimensions of the leaves and entire plant, the form of the capsule, and the tissue of the leaves, all tend to establish the conclusion that *Mnium* is a very natural genus. *Cinclidium*, a nearly allied genus, was at first incorporated with *Mnium* by the authors of the *Bryologia Europæa*, but the recent discovery of a second species of *Cinclidium*, by M. Schimper, has led to the restoration of that genus.

Linnæus first employed the name *Mnium* (from *μνυον*, *moss*) to denote a part of the *Bryeæ.* Dillenius included all the species under the name of *Bryum*, with other mosses more or less allied to this group. Seventeen species (exclusive of *Cinclidium*) are described in the *Bryologia Europæa.*

a. Leaves sharply serrated.

* Leaves with cartilaginous border.

257. 1. *Mnium affine* Bland. (*many-fruited Thyme Thread-Moss*); dioicous; fertile stems radiculose, erect, simple; sterile shoots procumbent or arched; lower leaves of the fertile stem remote, decurrent, oval-lanceolate; upper leaves crowded, elliptic-oblong, apiculate, with a narrow cartilaginous border, sharply serrated; capsules ovate-oblong, mostly aggregate; lid convex-apiculate. (Tab. LI.)

Mnium affine *Blandow*, Musc. Exsic. *Schwaegr. Bruch and Schimp.* Monogr. p. 30. t. 9, 10.
Mnium cuspidatum *β. Hedw.* Sp. Musc. t. 45. *Dill.* Musc. t. 53. f. 79. M.
Bryum Polla affinis *Bridel.*
Bryum affine *Hook.* in Eng. Fl. *Wilson*, in Eng. Bot. Suppl. t. 2739.

Hab. In shady woods, on banks, walls, &c., and in marshes; rare in fruit. Near Over, and on Knutsford Moor, Cheshire, *W. Wilson.* Mildenhall, Suffolk, *F. K. Eagle, Esq.* Inverness-shire, *Mr. A. Croall.* Fr. April, May.

Fertile stem 1—3 inches long. Upper leaves very large, crowded, oval or oblong, spreading and often recurved, undulated or crisped when dry, the nerve either ceasing below the apiculus, or continued to the extremity of the leaf, which has its cartilaginous margin spinuloso-serrate. The leaves of the creeping shoots are roundish and somewhat bifarious. Fruitstalks 1—2 inches long, often 2 or more together. Capsule pendulous, oblong, large, the mouth reddish. Lid shortly apiculate. Inner peristome more deeply coloured than the outer teeth, as is usual in this genus; cilia 2—3 together, appendiculate. It varies as follows: —

var. β. elatum; stem and fruitstalks elongated; growing in marshes.

var. γ. rugicum; stem more slender, stolons erect, shorter; leaves shorter, concave, with smaller and more obtuse serratures.—*Mnium rugicum* Laurer.

This, or a still more alpine variety or form of the species, with leaves often destitute of serratures, very obtuse and mucronate, has been found by Mr. A. Croall in several places in Scotland, first in the Carse of Ardersier, Inverness-shire, 1847 (barren); Fifeshire, June 1852; and in a marsh near Montrose, Forfarshire, June 1853, in fine fruit.

Bryum ciliare Greville, from N. America, appears to consist of two species, one of which is a variety of *M. affine*, with very long spinulose teeth; the other is *M. Drummondii* Br. and Sch., closely allied to *M. medium* Br. and Sch., differing from *M. affine* in the synoicous inflorescence, and in the erect (not recurved) leaves, scarcely crisped when dry.

258. 2. *Mnium cuspidatum* Hedw. (*pointed Thyme Thread-Moss*); synoicous; fertile stem erect, simple; lower leaves obovate-acuminate; upper leaves serrated, ovate-lanceolate; capsule subpendulous, ovate; lid convex, obtuse. (Tab. XXXI.)

Mnium cuspidatum *a. Hedw.* Sp. Musc. t. 45. f. 5, 6, 7. *Funck*, Deutsch. Moose, t. 33. f. 11. *Schwaegr. Br. and Sch.* Monogr. p. 29. t. 8.

Bryum cuspidatum *Schreb. Turn. Smith*, Eng. Bot. t. 1474. *Hook. and Tayl. Dill.* Musc. t. 53. f. 79. A—L.

Bryum Polla cuspidata *Bridel.* Hypnum aciphyllum *Web. and Mohr.*

Mnium serpyllifolium *β. Linn.*

Hab. On shady rocks and walls; especially in limestone districts. Fr. March, April.

Stems ½—1 inch long, rather densely cæspitose, radiculose; sterile branches somewhat procumbent or deflexed. Lower leaves scattered, more or less spreading, broadly ovate or obovate, acuminate; upper leaves longer, oval-acuminate, narrow at the base, as in other allied species, flattish, sometimes wavy, crisped when dry, the margin cartilaginous, simply serrated; nerve ceasing at or just below the apex. Capsule solitary, shorter and paler than in the preceding, on a shorter fruitstalk, and the lid mostly obtuse.

A smaller species than the preceding, essentially distinguished by the inflorescence.

259. 3. *Mnium rostratum* Schwaegr. (*long-beaked Thyme Thread-Moss*); synoicous; fertile stem short, decumbent at the base; barren shoots elongated, erect, or decumbent, or somewhat creeping; lower leaves ovate; upper leaves oval-oblong, obtuse, subapiculate, margin cartilaginous, bluntly dentate; fruitstalks aggregate; capsules oval, subpendulous; lid rostrate. (Tab. XXX.)

Mnium rostratum *Schwaegr.* Suppl. t. 79. *Funck*, Deutsch. Moose, t. 13. f. 15. *Br. and Sch.* Monogr. p. 27. t. 7.

Bryum rostratum *Schrad. Smith*, Eng. Bot. t. 1475. *Hook. and Tayl. Greville* (Hypnum *Web. and Mohr*).

Bryum Polla rostrata *Bridel.*

Bryum longirostrum *Bridel,* Meth.

Hab. Moist, shady rocks. Fr. April.

Stem ½—1 inch long. Terminal leaves in a spreading tuft, oblong-oval, recurved, somewhat undulated, especially when dry, more obtuse than in the allied species, with a very obscure point or mucro formed by the subexcurrent nerve, the border cartilaginous, bluntly toothed or serrated, all more or less decurrent, crisped when dry. Fruitstalks often 4 or more together, 1—2 inches long. Capsule more or less pendulous, ovate or oval, pale, with a reddish mouth. Lid rostrate, half as long as the capsule, or longer. Calyptra reddish.

This species is found almost everywhere throughout the globe.

Bryum rhynchophorum of Hook. and Harv. *Musci Indici*, and Hook. *Ic. Pl.* t. 20. f. 3., may be a variety with more coriaceous leaves, and appears to be the same as *B. coriaceum* of Griffith, *Musci Assamici*, and *Mnium rostratum* β. *Javanicum* of Nees.

340. 4. *Mnium orthorhynchum* Bridel (*short-beaked Thyme Thread-Moss*); dioicous; fertile stem simple; lower leaves distant, ovate-acuminate, decurrent; upper leaves ovate-lanceolate, or subspathulate, with a cartilaginous border, doubly spinuloso-serrate; capsule horizontal, oval; lid conico-rostellate. (Tab. LI.)

Mnium orthorhynchum *Bridel*, Sp. Musc. 3. 45. *Br. and Sch.* Monogr. p. 25. t. 5.
Mnium serratum β. *Schwaegr.* Suppl. t. 78.
Bryum Polla orthorhyncha *Bridel*, Bryol. Univ.

Hab. Woods, shady banks, rocks, &c. Mowthorpe Dale, Yorkshire, with barren flowers only, in company with *M. stellare*, Jan. 1844, *Mr. Spruce.* Near Hurst Pierpoint, Sussex, *Mr. Mitten.* Fr. Spring.

This species is allied to *M. serratum*, but the leaves are broader, more rigid, crisped and undulated when dry, and of a full green (not reddish) colour, the areolæ smaller and opaque. It is essentially distinguished from that species by the dioicous inflorescence, and is of much more rare occurrence throughout Europe; only two British localities are at present known. It varies in the breadth and shape of the leaves; ours has them broader than in the figure given by Bruch and Schimper, but agrees with specimens in Drummond's *Musci Americani*, No. 259. The Sussex specimens are also without fruit, and have the foliage more lax.

61. 5. *Mnium serratum* Bridel (*serrated Thyme Thread-Moss*); synoicous; fertile stem and sterile branches erect; leaves decurrent, ovate-acuminate and ovate-lanceolate, perichætial leaves lanceolate, all with doubly-spinous serratures and cartilaginous border; capsules mostly solitary, ovate, subpendulous; lid shortly rostrate. (Tab. XXXI.)

Mnium serratum *Bridel*, Sp. Musc. *Schwaegr. Br. and Sch.* Monogr. p. 24. t. 5.
Bryum serratum *Bridel*, Mant. Musc. *Schrader.*
Bryum Polla serrata *Bridel*, Bryol. Univ.
Bryum marginatum *Dickson*, Crypt. Fasc. 2. t. 5. f. 1. *Turner. Smith*, Eng. Bot. t. 1473. *Hook. and Taylor.*
Hypnum marginatum *Web. and Mohr.*

Hab. On moist rocks and shady banks, especially in limestone districts, and on the mountains. Not uncommon in Scotland. Fr. May, June.

Stems loosely cæspitose, about half an inch or an inch long, rather slender, erect, purplish, with loose scattered foliage, rooting at the base only. Leaves narrower than in the preceding species, varying from ovate to lanceolate, upper ones pale green, lower ones of a vinous-red tint, especially on the nerve and the cartilaginous border;

all of them slightly crisped when dry. Fruitstalks ½—1 inch long, reddish below, sometimes two together. Capsule more or less cernuous, oval, reddish at the mouth. Annulus subpersistent. Spores greenish. Lid with a short beak, by which character, as well as by the more delicate habit and the synoicous inflorescence, it is readily distinguished from the more common *M. hornum*. It is one of the smallest of the genus.

262. 6. *Mnium hornum* Linn., Hedw. (*swan-neck Thyme Thread-Moss*); dioicous; stem and barren shoots erect, simple; leaves oblong-lanceolate, crowded, erecto-patent, subdecurrent, serratures doubly-spinous, border cartilaginous; capsule subpendulous, oblong-ovate; lid mammillate. (TAB. XXXI.)

Mnium hornum *Hedw.* Sp. Musc. p. 188. *Linn.* Sp. Pl. *Funck*, Deutsch. Moose, t. 32. f. 7. *Br. and Sch.* Monogr. p. 22. t. 4.
Bryum hornum *Schreb.* *Turner.* *Smith*, Eng. Bot. t. 2271. *Hook. and Tayl.* *Dill.* Musc. t. 57. f. 71.
Bryum Polla horna *Bridel.*

Hab. Shady banks, and in woods at the roots of trees, &c., very frequent. Fr. May.

Stems growing in rather dense extensive patches, 1—3 inches long. Leaves narrowly lanceolate, almost linear, lower ones reddish, upper ones green, all with doubly spinous serratures and cartilaginous border, the nerve ceasing near the apex, and spinulose at the back. Capsule large, oblong, pale brown, or yellowish, on a long fruitstalk, which is arcuate at the summit, resembling a swan's neck. Lid convex, with a small point. Spores small.

This fine moss, with its numerous capsules, forms one of the greatest ornaments of shady banks in the spring, and prefers a turfy or barren sandy soil, where few other plants would grow. The short lid and the dioicous inflorescence distinguish it from the preceding species; and its different habit and straight rigid leaves prevent its being mistaken for *M. undulatum*.

263. 7. *Mnium undulatum* Hedw. (*long-leaved Thyme Thread-Moss*); dioicous; stem erect from a creeping rhizoma, with creeping or erect sterile shoots; leaves ligulate, upper ones very long, decurrent, undulated, with slightly cartilaginous border, simply dentato-serrate; capsules aggregate, oval-oblong, pendulous; lid convex-apiculate. (TAB. XXX.)

Mnium undulatum *Hedw.* Sp. Musc. p. 195. *Funck*, Deutsch. Moose, t. 33. f. 14. *Schwaegr.* *Br. and Sch.* Monogr. p. 20. t. 3.
Bryum ligulatum *Schreb.* *Smith*, Eng. Bot. t. 1449. *Hook.* in Fl. Lond. (with a fig.) *Hook. and Tayl.*
Bryum undulatum *Turner.* (Hypnum *Web. and Mohr.*)
Bryum Polla ligulata *Bridel*, Br. Univ.
Mnium serpyllifolium δ. *Linn.* Sp. Pl. *Dill.* Musc. t. 52. f. 76.

Hab. Moist shady banks, and in woods, but not common in fruit. Fr. April, May.

Flowering stem decumbent or creeping at the base, 1—2 inches long, or more, simple or branched at the top, the branches at first short, at length pendulous and flagelliform. Barren shoots long, more or less arched, procumbent, or creeping, taking root at the extremity, simple or branched. Leaves spreading, bright yellowish-green, decurrent, crisped when dry, the upper ones varying from oval-oblong to ligulate, undulated, obtuse, the border slightly cartilaginous, with simple teeth; nerve ceasing at or near the apex. Capsules 2—10 together, seldom solitary, oval or oblong, more or less pendulous, pale yellowish-brown, on long fruitstalks. Annulus large. Lid convex, with a small point. Spores small.

One of the finest species of the genus, readily known by its large, linguiform, undulated leaves, which somewhat resemble those of *Atrichum* (*Polytrichum*) *undulatum.* The antheridia and archegonia are very numerous in this species, and will account for the abundance of capsules produced from the same receptacle. The comparative rarity of fruit is owing to the frequent absence of plants with both kinds of flowers in a given locality, as in the case of *Bryum roseum* and other mosses with dioicous inflorescence.

** Leaves not bordered.

64 8. ***Mnium stellare*** Hedw. (*star-leaved Thyme Thread-Moss*); dioicous; stems and barren shoots erect; leaves oval-oblong, acuminate, decurrent, serrated, without a cartilaginous border, nerve ceasing below the apex; capsule drooping, ovate; lid hemispherical, obtuse. (TAB. LI.)

Mnium stellare *Hedw.* Sp. Musc. t. 40. *Schwaegr. Br. and Sch.* Monogr. p. 33. t. 13.

Bryum Polla stellaris *Bridel.* Hypnum *Web. and Mohr.*

Hab. Shady rocks and banks, especially in limestone districts; not unfrequent, but long overlooked; and not found with fruit in Britain. Mowthorpe Dale, Yorkshire, with fertile flowers, 1844, *Mr. Spruce.* Under the park paling at Betchworth Castle, Surrey, with barren flowers, *Mr. Mitten.* Fr. May, June.

Growing in rather dense soft patches, 1—2 inches in height, of a full green colour, sometimes with an indigo tint. Barren shoots somewhat recurved in the upper part. Leaves erecto-patent, scarcely crisped when dry, thin and rather brittle, flattish, varying from oval-acuminate to ovate-lanceolate, coarsely toothed above, the margin not at all thickened nor cartilaginous; areolæ roundish or granular; nerve ceasing below the apiculus. Capsule solitary, more or less drooping, ovate, olive-brown, narrower towards the mouth. Lid convex, not pointed. Annulus rather large. This species is remarkable for the absence of a thickened border to the serrated leaves, and is easily recognised.

b. Leaves nearly entire, without a border.

65. 9. *Mnium cinclidioides* Huebener (*large-leaved Thyme*

Thread-Moss); dioicous; stems and barren shoots erect, elongated, somewhat branched; leaves roundish-oval, or oval-oblong, large, scarcely toothed; capsule solitary, pendulous, oval; lid convex-apiculate. (TAB. LI.)

Mnium cinclidioides *Huebener*, Musc. Germ. p. 416. *Br. and Sch.* Monogr. p. 34. t. 14.
Bryum cinclidioides *C. Müller*, Syn. Musc.
Bryum punctatum (partly) *Drummond*, Musc. Scot.

Hab. In bogs and wet places on the Clova and other mountains of Scotland, mistaken for a variety of *Mnium punctatum.* Catlaw, *Mr. Lyell.* Clova Mountains and Hill of Findhaven near Forfar, *Mr. T. Drummond.* Not found in fruit in Britain. Fr. Summer.

Stems growing in dense yellowish-green patches, 2–6 inches in height, simple, or with slender lateral branches, barren shoots longer, more slender, without the covering of radicles which is seen on fertile specimens. Lower leaves broadly oval, obtuse, and obscurely apiculate; upper leaves very large, oval-ligulate, obtuse, or sometimes obscurely mucronate, somewhat undulated, of thin texture, the margin not cartilaginous, though the marginal cells are sometimes narrower than the rest; all the leaves are spreading, the uppermost more crowded, nearly entire, not much crisped when dry; the areolæ large, oblong-hexagonal; nerve ceasing below the apex. Fruitstalks mostly solitary, rarely two together, 1½—3 inches long, slender, purplish. Capsule pendulous, reddish-brown. Lid convex, with a small point. Annulus rather large.

This is one of the finest of the genus, very different from *M. punctatum* in the colour and structure of the large tender leaves, which are destitute of a border, and in the short lid. C. Müller refers it to *Bryum*, on account of the areolation of the leaf, regardless of the truly Mnioid habit.

c. Leaves entire, distinctly bordered.

266. 10. *Mnium punctatum* Hedw. (*dotted Thyme Thread-Moss*); dioicous; stems and barren shoots erect; leaves widely spreading, roundish; upper leaves crowded, larger, roundish-obovate, entire, with strong cartilaginous border, obscurely pointed, nerved almost or quite to the apex; capsule subpendulous, oval; lid rostellate. (TAB. XXX.)

Mnium punctatum *Hedw.* Sp. Musc. p. 193.; ejusd. Fund. Musc. t. 10. f. 66—69. *Funck*, Deutsch. Moose, t. 33. f. 16. *Br. and Sch.* Monogr. p. 19. t. 2.
Bryum punctatum *Schreb. Turner. Smith*, Eng. Bot. t. 1183. *Hook. and Tayl.* (Hypnum *Schrank. Web. and Mohr.*)
Bryum Polla punctata *Bridel.*
Mnium serpyllifolium *Linn. Hoffm. Dill.* Musc. t. 53. t. 81.
Bryum ellipticum *P. Beauv. Brid.* Meth.

Hab. In wet shady places, by rivulets, springs, &c. Fr. Feb., March.

Stems ½—3 inches high, more or less densely crowded, reddish below, and radiculose. Leaves widely spreading, large, roundish, the upper ones forming a somewhat rosaceous tuft, crisped when dry, roundish, or somewhat obovate, narrow at the base, the texture rather firm, almost coriaceous, the entire border thick and opaque, obtuse or obscurely pointed at the apex, flattish or somewhat undulated in the margin; nerve ceasing at or near the apex; lower leaves reddish or blackish; upper leaves green and somewhat glossy; the nerve and border purplish or blackish; areolæ roundish-hexagonal. Capsule more or less pendulous, shortly oval, mostly solitary, olive-brown, pale. Lid conico-rostellate, shorter than the capsule. Spores small, brownish. It varies in size, growing larger and taller in mountainous situations, and is easily distinguished by the thick-bordered leaves, and by the dioicous inflorescence, from the next species.

67. 11. *Mnium subglobosum* Br. and Sch. (*round-fruited Thyme Thread-Moss*); synoicous; stem and barren shoots erect; leaves spreading, roundish-obovate, obtuse, entire, with a very narrow subcartilaginous border, nerve ceasing below the apex; capsule roundish, small; lid rostellate. (TAB. LI.)

Mnium subglobosum *Br. and Sch.* Monogr. Suppl. fasc. 31. p. 3. t. 3.
Mnium pseudopunctatum *Br. and Sch.* Annot. in *Drummond,* Musc. Americ. No. 253.
Mnium punctatum var. subglobosum *Hampe MS.*
Bryum mnioides *Wilson,* in Eng. Bot. Suppl. t. 2907.

Hab. In bogs and marshes, not unfrequent; but long overlooked as a variety of *Mnium punctatum.* Cheshire and Yorkshire, *W. Wilson.* Near Todmordon, Lancashire, *Mr. John Nowell.* Inverness-shire, *Mr. A. Croall.* Fr. March.

This is a more slender and delicate species than the preceding. Leaves of less firm texture, obtuse, never pointed, with a narrower border, which is not thickened nor opaque, but formed of one or two series of elongated cells, and with the nerve always ceasing much below the apex; they are shorter, paler, and less crowded above than in the preceding species. Fruitstalks mostly solitary, sometimes two together, 1½ inch long. Capsule smaller, roundish, with a more contracted mouth, reddish-brown. Outer teeth reddish-brown. Annulus yellow, fragile, subpersistent. Spores green, twice as large as in the preceding. Lid small, conico-rostellate.

The synoicous inflorescence, with the above characters, abundantly distinguish this from *Mnium punctatum.* In its mode of innovation it often approaches to *Bryum,* and was for this reason named *Bryum mnioides* in the Supplement to *Eng. Botany,* with the view of calling the more attention to the true characters of the respective genera. It is admitted that, in general habit, this moss, no less than the preceding species, which has similar innovations, belongs evidently to this group or genus, apart from the true *Brya;* nor will the large size of *Bryum roseum,* and the still larger exotic species which are allied to it, create any real difficulty, if due attention be paid to the tissue of the leaves and to the structure of the barren flowers and their paraphyses.

53. CINCLIDIUM *Swartz.* Cupola Moss.

This genus is closely allied to *Mnium* in habit, and is chiefly distinguished by the singular structure of the peristome; perennial; growing in spongy bogs.

Stems densely cæspitose, matted together, and copiously beset with purplish radicles, their lateral innovations and barren erect shoots similar to those of *Mnium punctatum.*

Leaves roundish, large, coriaceous, more or less pointed, entire, the *border* thickened, cartilaginous and opaque, the *nerve* reaching nearly or quite to the apex; *areolæ* hexagonal.

Inflorescence synoicous or dioicous; *antheridia* mixed with clavate paraphyses.

Capsule pendulous, roundish-pyriform or narrowly pyriform, with a more or less distinct apophysis or neck. *Fruitstalks* solitary, or sometimes two together. *Peristome* double; *outer teeth* 16, short, obtuse, with very prominent membranous transverse lamellæ on the inner side, slightly hygrometric, subreflexed when moist, incurved when dry; *inner peristome* a cupuliform membrane with 16 perforations opposite to the outer teeth, and as many sharply carinate narrow processes opposite to their interstices, more deeply coloured than the outer teeth, to the lower lamellæ of which the inner peristome is coherent. *Annulus* small, rudimentary, persistent. *Spores* large. *Calyptra* small, cucullate, fugacious.

Cinclidium was at first united to *Mnium* by the able authors of the *Bryologia Europæa*; but has since, and with good reason, been separated from it. A second species has been discovered in Norway by M. Schimper, contrary to the prognostications of Bridel. Name from κιγλις, *lattice-hole;* in allusion to the apertures of the inner peristome.

268. *Cinclidium stygium* Swartz (*lurid Cupola-Moss*); synoicous; densely cæspitose; stems and barren shoots erect, radiculose; leaves large, roundish-obovate, apiculate, with an opaque cartilaginous border, nerve subexcurrent; capsule pendulous, roundish-pyriform or oval; lid convex, obtuse. (Tab. LII.)

Cinclidium stygium *Swartz*, in *Schrad.* Bot. Journ. 1801, t. 2. *Web. and Mohr. Schwaegr. Röhling. Bridel. Wilson,* in Eng. Bot. Suppl. t. 2840.
Mnium stygium *Br. and Sch.* Monogr. p. 17. t. 1.
Meesia stygia *Bridel*, Musc. Recent.
Amblyodon stygium *P. Beauv.*

Hab. In spongy bogs; rare in Britain, or frequently overlooked, from its resemblance to *Mnium punctatum.* Bog, near Malham Tarn, Yorkshire, June, 1836, *Mr. John Nowell.* In a boggy field near the same Tarn, *W. Wilson.*

Fr. June, July.

In habit and size not much unlike *Mnium punctatum*, but the stems are more compactly tufted and matted together with purplish radicles, giving a very sooty appearance to the plant, especially when dry. They are 1—4 inches long, everywhere beset with radicles, simple, or with slender lateral shoots that bear smaller scattered leaves. Lower leaves distant, upper ones crowded into a somewhat rosaceous tuft, spreading, crisped and undulated when dry, rigid, subcoriaceous, roundish-ovate or obovate, obtuse, with a small point, narrow at the base, the border thick and opaque, purplish, as well as the nerve, which is continued to the apex; areolæ roundish-hexagonal. Fruitstalks mostly solitary, sometimes 2 together. Capsule pendulous, oval subpyriform, with a short solid neck or apophysis, yellowish-brown when ripe. Lid convex, obtuse, or rarely with a small point. Annulus small, adhering to the margin of the lid. Inner peristome more deeply coloured than the outer teeth, between the interstices of which the carinate processes are sharply prominent.

The second species of this genus, *Cinclidium arcticum* Br. and S., differs from the above in the dioicous inflorescence, smaller leaves, less crisped when dry, narrower, less pendulous capsule, longer and more apiculate lid, and in the longer teeth of the peristome. It is found in abundance in the vicinity of Kongsvold, in bogs on the western side of Mount Knudshöe, and there only, in company with *Paludella squarrosa*, *Meesia uliginosa*, &c., growing in extensive blackish-green patches.

Reference to Figures of *Cinclidium stygium.*

1. Plant, nat. size. 3. Leaf, magnified. *s. l.* Section of leaf. *b.* Section of marginal portion of leaf, more highly magnified. *a. l.* Apex of leaf, highly magnified. *f.* Fringe, or peristome. *f. b.* Portion of peristome, more magnified. *s.* Sporules. *d.* One of the outer teeth, in profile. *d. s.* Two sections of the same, showing the laminæ.

SUBORDER XX. MIELICHHOFERIEÆ.

54. MIELICHHOFERIA *Nees and Hornsch.*

WEISSIA *Hook. and Tayl.*, &c.

A genus of mosses closely allied to the *Bryeæ*, but differing in the position of the fructification, and in other characters. *Stems* very slender, with a double axis of growth. The *flowers* terminal on secondary branches. *Leaves, capsule*, and *calyptra* as in *Pohlia*. *Peristome* as in *Anacalypta.*

Stems densely cæspitose, slender, fragile, more or less radiculose, with fastigiate ramification, the innovations axillary near the base.

Leaves disposed in eight rows; *lower ones* smaller and more distant; *upper ones* crowded, erecto-patent, somewhat imbricated, lanceolate, serrated above; *nerve* ceasing at or below the apex; *areolæ* lax, rhomboid.

Inflorescence dioicous; *flowers* gemmiform, terminal, on short axillary branches; *antheridia* few, axillary among the inner perigonial leaves; *archegonia* about 10 together, both organs mixed with filiform paraphyses.

Capsules several on the same plant, but each from a separate receptacle, pyriform, or clavate, oblique or pendulous, on a slender, wavy, or curved fruitstalk, varying in length, their texture thin and membranous, yellowish-brown; the *neck* or *apophysis* rather shorter than the sporangium, tapering into the fruitstalk. *Lid* short, conico-convex, or mammillate. *Annulus* large, spirally unrolling. *Peristome* simple; *teeth* 16, confluent at the dilated base, narrow, linear-subulate above, composed of a single series of cellules, flattish, with transverse prominent bars, pale yellowish, granulated, scarcely hygroscopic. *Calyptra* small, narrow, cucullate, fugacious. *Vaginula* oblong-conical. *Spores* of medium size, brownish, smooth.

Perennial; growing in the moist or dry crevices of alpine rocks, especially such as contain copper ore or sulphur. The species are few, only one being indigenous to Europe; its remarkable varieties have however been sometimes regarded as distinct species. The fructification of *Mielichhoferia* is *cladocarpous*, an intermediate state between acrocarpous and pleurocarpous, agreeing with the first in the perfectly formed distinct vaginula, and with the latter in the position of the fertile ramulus, which puts forth radicles at its base, and in other respects greatly resembles the perichætium of the true *pleurocarpi.*

The genus *Schizhymenium* of Harvey (*Hook. Ic. Plant.* t. 202.) is incorrectly defined, and has truly a double peristome; the short outer teeth having fallen away from nearly all the specimens, they have been overlooked, and only the inner peristome is noticed in the generic character; thus *Schizhymenium* may be regarded as a more perfectly developed species of *Mielichhoferia. Didymodon megalocarpus* Schwaegr. *Suppl.* t. 265., together with *Mielichhoferia Jamesoni* Taylor, constitute another genus of this group (*Pleurogonium* Wils. MS.), the peristome being formed of 8 pairs of broad short teeth, and the fructification of so ambiguous a character that it is difficult to decide whether (in the latter moss especially) the short fertile ramulus is really such, or a short primordial stem, with an elongated barren branch growing from its base.

269. *Mielichhoferia nitida* Hornsch. (*Mielichhofer's Thread-Moss*); leaves erecto-patent, larger and more crowded above, ovate-lanceolate, serrated at the apex; capsule suberect, pyriform; lid conical, very short. (TAB. LXI.)

Mielichhoferia nitida *Nees and Hornsch.* Bryol. Germ. t. 41. *Br. and Sch.* Monogr. p. 6. t. 1, 2.
Weissia Mielichhoferiana *Funck*, in *Hoppe and Hornsch.* Regens. Bot. Zeit. 1819, p. 86. *Hooker*, Musc. Exot. t. 101. *Schwaegr.* Suppl. t. 114.
Oreas mielichhoferi *Bridel*, Bryol. Univ.

var. β. gracilis; more densely tufted; leaves shorter, more crowded, imbricated; capsule erect.

var. γ. intermedia; densely tufted; leaves erect, narrower; capsule smaller, drooping on a curved fruitstalk, pale olive coloured.

var. δ. elongata; stems compactly tufted, more or less elongated, blackish-brown below; leaves imbricated; capsule drooping, on a short curved fruitstalk, of thicker texture, olive coloured.

Mielichhoferia elongata *Nees and Hornsch.* Bryol. Germ. t. 41. f. 2.
Weissia mielichhoferia β. elongata *Schwaegr.* Suppl. t. 114.
Weissia elongata *Hook.* Musci Exot. t. 102.
Oreas elongata *Bridel*, Bryol. Univ.

Hab. The var. β. only, and in a barren state, a single patch, was found by *Dr. Greville*, Aug. 1830, on moist rocks at the Head of Glen Callater. Fr. Aug., Sept.

The stems of the native specimen before us are 2 inches long, very compactly tufted and matted together with radicles. Leaves at the extremity of the shoots bright green; elsewhere of a deep purplish glossy brown, small, crowded, imbricated and erect when dry.

SUBORDER XXI. MEESIEÆ.

55. PALUDELLA *Ehrh.*

BRYUM *Hedwig*, &c. (ex parte).

A genus allied to *Meesia* in habit, with the peristome as in *Pohlia*. Perennial, growing in spongy bogs, to which the name *Paludella* refers.

Stems elongated, erect, mostly simple, densely radiculose, cæspitose, with one or two innovations from the floral apex.

Leaves in five rows, semiamplexicaul, decurrent, crowded, squarrose, much recurved, ovate-lanceolate, carinate, nerved almost to the apex; *areolæ* small, roundish, dot-like, prominent or papillose; *perichætial leaves* elongated, nearly erect.

Inflorescence dioicous; *barren flower* discoid, terminal; *antheridia* with clavate paraphyses; *perigonial leaves* very broad, acuminated, concave.

Capsule terminal, solitary, on a long fruitstalk, cernuous or suberect, oval-oblong, slightly curved, rather small. *Lid* mammillate. *Annulus* large, spirally unrolling. *Peristome* as in *Bryum; inner* without cilia. *Calyptra* small, cucullate. *Spores* small.

Of this genus only one species is known.

270 *Paludella squarrosa* Bridel (*drooping-leaved Thread-Moss*). (TAB. L.)

Brid. Bryol. Univ. vol. 2. p. 1. 733. *Schwaegr.* Suppl. t. 161. *Br. and Sch.* Monogr. p. 3. t. 1.

Bryum squarrosum *Hedw.* Sp. Musc. t. 44. *Swartz*, Musc. Suec. *Hook.* in Eng. Fl. *Funck*, Deutsch. Moose, t. 31. f. 28. *Wilson*, in Eng. Bot. Suppl. t. 2767.
Mnium squarrosum *Linn. Fil.*
Orthopyxis squarrosa *P. Beauv.*
Meesia squarrosa *Wahlenb.*
Hypnum paludella *Web. and Mohr.*

Hab. In spongy bogs. Knutsford Moor, Cheshire, April, 1832, *W. Wilson.* Bog near Terrington, Yorkshire, 1842, *Mr. Ibbotson.* A specimen in the *Dillenian Herbarium*, but neither described nor figured in the *Historia Muscorum*, is mentioned to have been given by *W. Harrison* of Manchester, and was probably gathered by him in the station first named; the fruit has not yet been found in Britain.

Fr. Summer.

Growing in bright green or yellowish patches. Stems 2—6 inches long or more, covered with brown radicles. Leaves widely spreading and much recurved, obovate-lanceolate, acuminate, decurrent, sharply carinate, denticulate at the apex; margin recurved below, plane above; nerve ceasing near the apex; terminal leaves larger and more crowded; those of the perichætium longer, narrower, suberect. Fruit-stalk 1½ inch long or more. Capsule more or less inclined or oblique, elliptic-oblong, somewhat bent and irregular, smooth, gibbous at the back, the neck short. Lid small, mammillate, more or less oblique. Outer teeth as in *Bryum;* inner peristome with narrow carinate processes, which are either lacunose or entire; cilia none. Calyptra yellowish, cloven on one side.

In this, as in other dioicous mosses, where flowers of both kinds are rarely found in the same locality, the fruit is seldom visible. In habit *Paludella squarrosa* bears considerable analogy to some exotic species of *Zygodon*, or of an allied genus of the same family, one species of which is *Aulacomnion pentastichum* of Montagne, from Chili, with the peristome as in *Schlotheimia;* the other is *Leptostomum squrrosum* of Dr. Taylor, from the Andes of Quito: of this we have not seen perfect specimens, but the peristome appears to be that of *Zygodon.* In both the lid is rostrate, and very different from that of the genera to which they have been referred.

56. MEESIA *Hedwig.*

BRYUM (partly) *Hook. and Tayl.*

A genus of large, handsome mosses, with terminal fructification, in habit approaching to *Bryum*, but in the form and direction of the capsule related to *Funaria*, and the fruitstalk usually very long. Perennial, growing in wet places, more or less alpine.

Stems cæspitose, elongated, radiculose, sparingly branched, innovations from below the flowering apex.

Leaves in 3 or 8 rows, more or less crowded; *upper ones* forming a terminal cluster, lanceolate or subulate, more or less obtuse, erect or spreading, mostly entire; the *nerve* strong, ceasing below the apex; *areolæ* small, dense.

Inflorescence terminal, synoicous, monoicous, or dioicous. *Barren flower* in the dioicous species discoid, in other cases gemmiform; *antheridia* more or less numerous, oblong, shortly pedicellate, with clavate paraphyses. *Fertile flower* gemmiform; *archegonia* few, with short styles.

Capsule solitary on a long fruitstalk, suberect, obovate or clavate, curved, gibbous at the back, the *mouth* small and oblique, the *neck* or *apophysis* long, tapering into the fruitstalk, its texture thick and firm, more incurved when dry, smooth. *Lid* small, conical. *Annulus* small, subpersistent. *Calyptra* at first conico-submitriform, inflexed at the base, fugacious. *Peristome* double; *outer teeth* 16, short, obtuse, scarcely hygroscopic, more or less united to the inner peristome, entire or sometimes splitting along the medial line; *inner peristome* a membrane divided, almost to the base, into 16 narrow carinate processes, much longer than the outer teeth. *Spores* rather large, smooth. *Vaginula* oblong.

Of this genus there are four species, all included in the *Bryologia Europæa.* Name in honour of David Mees, a Dutch botanist.

a. Inflorescence synoicous.

1. *Meesia longiseta* Hedw. (*long-stalked Meesia*); stem elongated, tomentous; leaves remote, spreading, decurrent, ovate-lanceolate, acuminate, twisted when dry, margin plane, entire; capsule cernuous, pyriform, incurved; lid conical-obtuse; fruitstalk very long.

Meesia longiseta *Hedw.* St. Crypt. i. t. 21, 22. Sp. Musc. p. 173. (excl. syn.) *Br. and Sch.* Monogr. p. 6. t. 2.

Diplocomium longisetum *Web. and Mohr.*

Bryum triquetrum *Turner*, Musc. Hib. p. 115. (not of *Hook. and Tayl.* tab. xxviii. which is *Meesia tristicha*).

Hab. On the borders of some lake in the north of Ireland, *Dr. Scott.*

A very dubious native. Dr. Scott's specimens in *Herb. Turner*, with one solitary exception, belong to *Amblyodon dealbatus*. The single stem here alluded to has entire leaves, and belongs to *Meesia longiseta*, but it may be only a foreign specimen. The *Eng. Bot.* figure, t. 2394., is made from Swedish and Swiss specimens of *M. tristicha*, with serrated, spreading, trifarious leaves, distinguished from *M. longiseta* also by its dioicous inflorescence. The two species often grow intermixed, and have hence been confounded.

The stems of *M. longiseta* are 3—6 inches long. Fruitstalk 4 inches or more. Capsule clavate-pyriform, oblique, incurved, reddish-brown, or chestnut-coloured. Lid conical, small, more or less obtuse. Outer teeth short, united at the inflexed edges to the inner peristome, but less completely so than in *M. tristicha*. Annulus simple. Spores rather large. The inner peristome has occasionally traces of cilia.

Meesia Albertini of Bruch and Schimper differs in its smaller size and less acute leaves, with recurved margin; the capsule also is shorter; outer teeth very short; annulus none; inflorescence monoicous.

b. Inflorescence monoicous or polygamous.

272. 2. *Meesia uliginosa* Hedw. (*dwarf Meesia*); inflorescence monoicous and synoicous in the same plant; leaves suberect, lanceolate-subulate, or linear, obtuse, entire, margin recurved; nerve thick, ceasing below the apex; capsule clavate-pyriform, subcernuous, incurved; lid conical, obtuse. (Tab. XXVIII.)

Meesia uliginosa *Hedw.* St. Crypt. i. t. 1, 2. *Funck*, Deutsch. Moose, t. 28. f. 1. *Bridel. Schwaegr. Web. and Mohr. Swartz. Wahlenb. Bruch and Schimp.* Monogr. p. 5. t. 1.

Amblyodon uliginosus *P. Beauv.*

Bryum trichodes *Linn.* Sp. Pl. p. 1585. *Dickson. Smith*, Eng. Bot. t. 1517. *Hook. and Tayl.* tab. xxviii.

var. β. alpina; leaves straight, subsecund, more acute; capsule shorter.

Meesia alpina *Funck.*

M. stricta angustifolia *Bridel*, Bryol. Univ.

var. γ. minor; dwarfish; leaves shorter, erect; capsule very short, on a short fruitstalk.

Meesia minor *Bridel*, Bryol. Univ.

M. uliginosa β. minor *Schwaegr. Wahlenberg.*

Hab. In wet places by springs, and in boggy or marshy places, chiefly on the Highland Mountains. Northumberland, *Mr. Winch.* Not observed on any of the Welsh Mountains. Sand Hills on the shore at Southport, Lancashire. Fr. July, Aug.

Stems ½—1 inch long, with erect fastigiate innovations of the same length, arising from the base of the terminal flower, radiculose. Lower leaves scattered, lanceolate, obtuse; upper leaves longer and larger, more linear, crowded, obtuse, entire, rather rigid and shining, deep or yellowish-green; areolæ quadrate or hexagonal; nerve thick, ceasing below the apex. Inflorescence various; barren flower sometimes terminal, spreading, almost discoid, with numerous antheridia and subclavate paraphyses; synoicous flower nearly closed, gemmiform, with few antheridia and many archegonia; fertile flower narrowly gemmiform, small. Capsule more or less oblong-pyriform, incurved, the mouth small, reddish-brown. Lid small, truncate or depressed at the apex. Annulus simple. Outer teeth shorter than the inner peristome, longer than in other species. Fruitstalk about 2 inches long.

57. AMBLYODON *P. Beauv.*

Bryum (partly) *Hook. and Taylor.*

This genus, with the inflorescence and capsule of *Meesia*, has the leaves loosely reticulated and membranous, as in *Funaria*. Only one species is known. Perennial, growing in wet places, chiefly in mountainous districts.

Stems gregarious, or cæspitose, short, sparingly branched, the older stems with innovations, in pairs, from below the flowering apex, radiculose in the lower part, and there destitute of leaves.

Leaves in eight rows; *lower ones* distant; *upper ones* more crowded, moderately spreading, widely lanceolate, denticulate at the apex, of thin soft texture, with large rhomboid areolæ; *nerve* ceasing below the apex.

Inflorescence monoicous or polygamous. *Barren flowers* discoid, the rest gemmiform. *Antheridia* of the barren flower numerous, with clavate paraphyses; *archegonia* with long styles.

Capsule terminal, solitary, on an elongated fruitstalk, clavate, or subpyriform, incurved, suberect; the *mouth* small and oblique; the *neck* long and tapering into the fruitstalk. *Lid* small, conical, obtuse. *Calyptra* at first conico-mitriform, inflexed at the base, at length split on one side, small. *Annulus* small, subpersistent. *Peristome* double; *outer teeth* as in *Bryum*, but shorter than the inner peristome, and not united to it, truncated, or acute, slightly spreading; *inner peristome* as in *Pohlia*, but more deeply divided into 16 narrow carinate processes, without intermediate cilia. *Spores* rather large, smoothish. Name from *αμϐλυς, blunt;* and *οδων, tooth.*

Amblyodon dealbatus P. Beauv. (*lesser, pale Thread-Moss*). (Tab. XXVIII.)

Amblyodon dealbatus *P. Beauv.* Prodr. p. 44. *Br. and Sch.* Monogr. p. 5. t. 1.

Meesia dealbata *Hedw.* Sp. Musc. t. 41. *Swartz*, Musc. Suec. t. 5. f. 10. *Bridel. Web. and Mohr. Schwaegr. Wahlenb.*

Bryum dealbatum *Dicks.* Crypt. Fasc. 2. t. 5. f. 3. *Turner. Smith*, Eng. Bot. t. 1571. *Hook. and Tayl.* tab. xxviii.

Hab. In wet places on the mountains of Scotland and Ireland;

not observed on any of the Welsh mountains. Suffolk, *F. K. Eagle, Esq.* Near Malham Tarn, Yorkshire, *W. Wilson.* Near Todmorden, Lancashire, *Mr. Nowell.* Sand Hills at Southport and Crosby, Lancashire. Fr. June, July.

Stem ½—1 inch long. Leaves widely lanceolate, acute, plane, erect, and scarcely crisped when dry, loosely reticulated and subdiaphanous, obscurely denticulate at the apex, the nerve ceasing below the apex, their colour pale green or whitish. Fruitstalk about 1½ inch long or more, reddish, twisted to the left when dry. Capsule clavate-pyriform, incurved, suberect, reddish-brown, the mouth small and oblique. Lid conical. Annulus fragmentary, small. Peristome double; outer teeth reddish-brown, variable in length, and sometimes acute, considerably shorter than the processes of the inner peristome. Calyptra at first conico-mitriform, inflexed at the base, as in *Splachnum*, at length split on one side.

SUBORDER XXII. FUNARIEÆ.

58. FUNARIA *Schreber.* Cord-Moss.

A genus of mosses with the capsule obliquely pyriform, as in *Meesia* and *Amblyodon*, and with the habit, leaves, inflorescence, and calyptra of *Physcomitrium*. Terrestrial, acrocarpous, subbiennial, loosely cæspitose.

Stem at first simple, terminated by a barren, discoid flower; subsequently branched, the branches bearing terminal fertile flowers, base of the stem and branches rooting.

Leaves in 3 or 5 rows; *lower ones* remote; *upper ones* larger, crowded into a terminal cluster, ovate, or obovate-acuminate, of thin texture, composed of large succulent oblong-hexagonal cellules; the *nerve* also loosely cellular, ceasing at or below the apex.

Inflorescence monoicous. *Flowers* terminal; *barren flower* discoid. *Perigonial leaves* 3—5, spreading. *Antheridia* numerous, small, oblong-oval, subsessile, mixed with longer paraphyses, which are much thickened and dilated at the summit, the terminal cellule almost triangular and compressed, containing chlorophyll. *Archegonia* few, with long styles. *Paraphyses* very short and indistinct.

Capsule solitary, obliquely pyriform, subventricose, of thick texture; the *mouth* more or less oblique and often small; the *neck* or *apophysis* tapering into the fruitstalk, suberect or cernuous, on a straight or curved fruitstalk, smooth or furrowed when dry. *Annulus* large, spirally unrolling, or in some species entirely wanting. *Lid* conical or convex and obtuse. *Peristome* double; *outer teeth* 16, oblique, lanceolate-tapering, with numerous prominent trabeculæ on the inner side, all connected at their apices by a small reticulated circular disk; they are also longitudinally marked with fine striæ, and are remarkably hygrometric, spreading outwards as they dry after the rupture of the connecting membrane; *inner peristome* a membrane divided into 16 lanceolate processes opposite to the outer teeth, each process marked with a medial or vertical line, and at its base somewhat coherent to the opposite outer tooth. *Calyptra* vesicular or inflated below, subulate or cylindrical above, the inflated part often quadrangular in an early stage, smooth, membranous, at length split on one side, not soon falling away. *Vaginula* oblong, its apex at first loosely cellular, concealed within the base of the young calyptra previous to its separation from the vaginula. *Spores* rather large, reddish, punctulate. *Sporangium* at first much smaller than the external capsule, to the walls of which it is attached by numerous cellular fibres containing chlorophyll, and it is supported on a pedicel of similar cellular tissue.

The obliquely pyriform capsule and double peristome distinguish the *Funariæ* from the closely allied genera *Entosthodon* and *Physcomitrium.* In other respects the three genera form a very natural family.

The mode of torsion of the fruitstalk is said to present a constant character for the different species of *Funaria.*

For an analysis of the young fructification of *Funaria hygrometrica* see Mr. Valentine's essay on the subject, in the *Transactions of the Linnæan Society*, vol. xviii. pt. 2. p. 239. According to that account, confirmed by our own observations, the base of the young fruitstalk, at first included within the fecundated archegonium, penetrates downwards into the substance of the receptacle. The top of the fruitstalk at first extends to the very summit of the calyptra; but, as it swells, the calyptra is gradually elevated until the inflated part of the latter surrounds the young capsule, and the subulate portion of the calyptra stands above it.

Five species are described in the *Bryologia Europæa.* Name from *funis*, a cord; from the twisting of the fruitstalk.

A. Capsule furnished with an annulus; fruitstalk arcuate.

1. *Funaria hygrometrica* Hedw. (*common Cord-Moss*); perichætial leaves connivent, ovate-lanceolate, concave, entire, nerved to the apex; perigonial leaves denticulate; capsule pyriform-incurved, furrowed when dry, border of the mouth corrugated; fruitstalk curved, flexuose. (Tab. XX.)

Funaria hygrometrica *Hedw.* Sp. Musc. p. 172. *Turner. Smith*, Eng. Bot. t. 342. *Web. and Mohr. Bridel. Funck*, Deutsch. Moose, t. 27. f. 1. *Schwaegr. Hook. and Tayl. Br. and Sch.* Monogr. p. 8. t. 3.

Funaria androgyna *and* campylopus *Bridel*, Bryol. Univ.

Mnium hygrometricum *Linn.* Sp. Pl. *Dill.* Musc. t. 52. f. 75.

Koelreuteria hygrometrica *Hedw.* Fund. Musc. vol. 1. t. 5. f. 21.; vol. 2. t. 3. f. 11., t. 5. f. 25, 26., t. 10. f. 58—61.

var. β. patula; stem more slender, branched; terminal leaves spreading, somewhat undulated, twisted when dry.

var. γ. calvescens; stem and leaves as in β.; fruitstalk elongated, straight; capsule more slender, suberect.

Funaria calvescens *Schwaegr.* Suppl. t. 65. *Bridel,* Bryol. Univ.

Hab. Almost everywhere, on banks, walls, &c., especially in burned or carbonaceous soil; var. β. in more moist situations; var. γ. in moist and warm situations. Fr. May, Nov.

Stems usually crowded, or cæspitose, $\frac{1}{4}$—1 inch long. Lower leaves scattered, more or less spreading; perichætial leaves larger, clustered together, so as to form a sort of bud, broadly ovate-lanceolate, very concave, entire, the nerve reaching almost or quite to the apex; perigonial leaves 3—5, widely spreading, subspathulate, denticulate at the apex, and still more evidently so at the base where the margin is recurved. Capsule pyriform-ventricose, furrowed when dry, the mouth very oblique, surrounded by a finely corrugated border, not observable in any other species, varying from deep yellow to orange or reddish as it ripens. Fruitstalk $\frac{1}{2}$—3 inches long, arcuate, flexuose, the upper part twisting to the right when dry, the lower part in an opposite direction. Lid plano-convex, with a red tumid border, distinctly grooved for the lodgment of the large dehiscent annulus, which unrolls spirally immediately after the lid falls away. Outer peristome reddish, inner yellow. Spores small, reddish-brown. The var. γ. *calvescens* is more frequent in hot climates, where it grows to a larger size.

F. microstoma of Bruch and Schimper differs from *F. hygrometrica,* in the very small mouth of the capsule, surrounded by a smooth not corrugated border, and in the rudimentary inner peristome and larger spores.

B. Capsule destitute of an annulus; fruitstalk straight.

275. 2. ***Funaria Hibernica*** Hook. (***Irish Cord-Moss***); leaves spreading, oval-oblong, tapering gradually to a point, sharply serrated; capsule shortly pyriform; annulus none; lid convex, papillate; fruitstalk twisted to the left when dry. (Tab. XX.)

Funaria Hibernica *Hook.* in Fl. Lond. ed. 2. (with a figure). *Bridel,* Bryol. Univ. *Br. and Sch.* Monogr. p. 7. t. 2.

F. Mühlenbergii *Web. and Mohr. Mougeot and Nestler,* Stirp. Crypt. No. 726. *Funck,* Moos. Tasch. t. 33. *De Notaris,* Syll. Musc. (ex parte). *Drummond,* Musci Americani, No. 236.

Hab. Originally detected near Cork, by Mr. James Drummond, "on chalky soil, never on the roof of a cottage, as stated by Dr. Hooker," according to a memorandum in *Herb. Arnott,* on the authority of Mr. Drummond. The specimen in *Herb. Hooker* is stated to have been gathered by him on the roof of a cottage, near Blarney, and this probably on the authority of the late Dr. Taylor. Near Matlock, Derbyshire, on a limestone soil, and in similar situations near Conway, N. Wales, *W. Wilson*. Often confounded with the next species. Fr. April, May.

This species so strongly resembles the next, that, instead of a detailed description, we think it best to point out the chief marks by which it may be distinguished. In size it is somewhat larger. Leaves more gradually tapering, longer, more acutely serrated. Fruitstalk altogether twisting to the left when dry. Capsule longer and less inflated. It is stated by Bruch and Schimper to grow only on arenaceous rocks and soil of the same character; but we have not observed it to grow on the millstone grit which so frequently alternates with limestone in the neighbourhood of Matlock; nor have we any proof in Britain of its preferring a different locality from that where *F. Mühlenbergii* grows. The leaves of the original specimen are somewhat obovate-acuminate, wider than the figure in *Bryologia Europæa*, and those from Wales and Derbyshire still more so; but the specimen from Dr. Taylor agrees well with the one represented by Bruch and Schimper. It may be right to notice here, on Mr. Drummond's authority, that the experiment of raising the species of *Funaria* from seed was not instituted for the purpose of testing the specific characters, and the precautions observed were quite inadequate to decide that question, the three species having been kept in the same paper, and their seeds or spores consequently mixed together at the time of sowing.

Funaria serrata of Bridel is said to differ from *F. Hibernica* principally in the plano-convex lid, and in the torsion of the dry fruitstalk, which is in an opposite direction.

3. *Funaria Mühlenbergii* Schwaegr. (*Dr. Mühlenberg's Cord-Moss*); stem short; leaves erecto-patent, widely ovate, suddenly acuminate, bluntly serrated; capsule shortly pyriform; lid conico-convex, obtuse; annulus none; fruitstalk twisted to the right when dry. (TAB. XX.)

Funaria Mühlenbergii *Schwaegr.* Suppl. t. 66. *Turner. Smith*, Eng. Bot. t. 1497. *Hook. and Tayl. Br. and Sch.* Monogr. p. 6. t. 1.

Funaria calcarea *Wahlenberg. Bridel*, Bryol. Univ.

var. β. patula; leaves shortly acuminated, spreading, almost entire.

Funaria neglecta *De Notaris MS.*

var. γ. flaccida; leaves longer, flexuose or twisted.

Hab. On calcareous banks, walls, &c. First detected by Dr. Mühlenberg in Pennsylvania. Fr. April, May.

Growing in lax patches. Stems 1—3 lines in length, rooting at the base only, leafless in the lower part, mostly simple. Lower leaves more or less spreading, or reflexed; upper leaves more erect, larger, concave, broadly ovate or obovate, suddenly acuminated, not gradually tapering above, obscurely serrated, the nerve ceasing below the apex. Capsule smooth, suberect, yellowish or reddish-brown, more or less constricted below the mouth when dry. Fruitstalk ½ inch long or more, the upper part twisted towards the right, the lower part towards the left, when dry. Annulus none. Lid with a reddish border. Outer peristome bright red. Spores more than twice the diameter of those of *F. hygrometica*, granular on the surface. Calyptra yellowish.

59. ENTOSTHODON *Schwaegr.*

WEISSIA (partly) *Hook. and Tayl.*

A genus of *Funariæ*, intermediate between *Funaria* and *Physcomitrium*, agreeing with the latter in the symmetrical, not oblique, capsule. Terrestrial, subbiennial, loosely cæspitose.

Stem, *leaves*, and *inflorescence* as in *Physcomitrium.*

Capsule erect, pyriform, symmetrical. *Lid* plano-convex. *Annulus* none. *Calyptra* inflated below, cucullate. *Peristome* single; *teeth* 16, inserted below the orifice of the capsule, simple or double, somewhat oblique, lanceolate or tapering, transversely barred, with prominent trabeculæ on the inner side, flattish at the back, erect when dry, converging when moist. *Spores* rather small.

Distinguished from *Funaria* by the single peristome and the regular capsule. Name from εντοσθεν, within, and οδων, tooth.

About five species of *Entosthodon* are known, only one of which is indigenous to Europe.

277. *Entosthodon Templetoni* Schwaegr. (*Templeton's Cord-Moss*); lower leaves ovate-acuminate; upper leaves crowded, obovate-acuminate, subdenticulate, nerve ceasing below the apex; capsule narrowly pyriform; lid plano-convex; teeth of the peristome lanceolate-subulate, simple. (TAB. XIV.)

Entosthodon Templetoni *Schwaegr.* Suppl. t. 113. *Bridel. De Notaris. Br. and Sch.* Monogr. p. 3. t. 1.

Weissia Templetoni *Hook.* in Fl. Lond. ed. 2. (with a figure). *Hook. and Tayl.*

Funaria Templetoni *Smith*, Eng. Bot. t. 2524.

Bryum attenuatum *Dickson*, Crypt. iv. p. 8. t. 10. f. 8. (*Herb. Turner*). *Smith*, Fl. Brit. Eng. Bot. t. 2433. (*extravagantly figured*).

Hab. Moist shady banks, crevices of rocks, &c. Frequent near Kenmare, Ireland. Scotland. Wales. By the river Irwell, near the Clifton Viaduct, above Manchester, on Sandstone rocks, *Mr. John Horsefield.* Fr. July.

Stems 3 lines to ½ inch in height, loosely cæspitose, the fertile innovation arising from below the barren flower. Lower leaves distant, spreading or reflexed; upper ones collected into a rosaceous spreading tuft, about 6 or 8 in number, obovate-acuminate, slightly concave, the margin somewhat crenate in consequence of the prominent cells, but scarcely toothed; nerve ceasing below the apex; areolæ rather large, oblong-hexagonal, thin and pellucid. Fruitstalk about ½ inch long, reddish or yellowish. Capsule subclavate, or narrowly pyriform, regular, erect, the neck long and tapering downwards into the fruitstalk, the capsule constricted below the dilated mouth when dry, yellowish or reddish-brown. Annulus none. Lid flat when dry. Teeth of the peristome distantly barred, without any medial line, dilated at the base, reddish, hygroscopic, fugacious. Spores yellowish-brown, nearly smooth.

60. PHYSCOMITRIUM *Bridel.*

GYMNOSTOMUM (partly) *Hook. and Tayl.*

This genus resembles *Entosthodon* in every positive character, differing only in the absence of a peristome, and, except *P. pyriforme* and *P. sphæricum,* which have the calyptra submitriform and lacinate, ought perhaps to be united with *Entosthodon,* as is done in C. Müller's *Synopsis Musc.* The species are annual or perhaps biennial, growing on newly exposed soil.

Primary stem terminated by a discoid barren flower, from below which arises a longer branch bearing a terminal fertile flower, as in other members of the family of *Funarieæ.*

Leaves in three or five rows, upper ones crowded into a spreading tuft, ovate or obovate-acuminate, of thin texture, composed of large, oblong, succulent cellules; the *nerve* also loosely cellular, ceasing at or below the apex.

Inflorescence monoicous. *Antheridia* mixed with clavate paraphyses, which are much thickened and dilated at the summit. *Archegonia* few, without paraphyses.

Capsule solitary, on a straight or curved fruitstalk, pyriform, or clavate, regular, of thick texture, when dry wide-mouthed and cyathiform. *Lid* convex, obtuse, or apiculate. *Annulus* and *peristome* none. *Calyptra* inflated below, smooth, cucullate. *Spores* rather large, reddish-brown, punctulate.

Seven species are described in the *Bryologia Europæa.* Name from φυσκη, *a bladder,* and μιτριον, *calyptra.*

1. *Physcomitrium ericetorum* De Notaris (*narrow-leaved Bladder-Moss*); leaves oval-lanceolate, margined, distantly toothed; capsule erect, small, pyriform; lid convex. (TAB. VII.)

Physcomitrium ericetorum *Bruch and Sch.* Monogr. p. 13. t. 3.

Entosthodon ericetorum *C. Müll.* Syn. Musc. i. 122.

P. Bonplandii *Br. and Sch. De Notaris. Mougeot and Nestler,* Strip. Crypt. No. 1004. (not of *Bridel*).

Gymnostomum Ahnfeldtii *Fries,* in *Hartm.* Skand. Fl.

Gymnostomum fasciculare (partly) *Hook. and Tayl. Turner. Smith,* Eng. Bot., t. 1245. (not of *Dickson*).

Gymnostomum obtusum *Hedw.* Sp. Musc. t. 2. (not of *Smith,* nor of *Turner*).

Bryum obtusum *Dickson*, Crypt. Fasc. ii. p. 5. t. 4. f. 7. (according to an authentic specimen in *Herb. Turner*).
Gymnostomum Salomoneum (according to *Smith* in *Herb. Turner*).
Bryum Ægypti of *Hasselquist* (see *Eng. Bot.* t. 1245.).

Hab. On moist shady banks, by rivulets, on heaths, &c.; more frequent in mountainous districts. Fr. March, April.

Stems gregarious, short, scarcely 3 lines in length. Lower leaves distant, small, oblong-lanceolate; upper leaves collected into a spreading tuft, twice as large, obovate-lanceolate, concave, straight or slightly twisted, the margin thickened, and somewhat coloured, serrated or toothed in the upper part; nerve ceasing below the apex, pale green; the areolæ large and pellucid. Capsule small, erect, pyriform, reddish, constricted below the mouth when dry, its texture thick and opaque. Lid plano-convex. Calyptra inflated below, cloven on one side. Spores small, almost smooth.

This species has been often confounded with the true *Gymnostomum fasciculare* of Hedwig, but is a smaller species, with narrower, more pellucid, distinctly margined leaves. According to Smith, this is the *Hyssop of Solomon.* In size it much resembles the true *Physcomitrium Bonplandii*, a South American species, with broader leaves not thickened in the margin. *Gymnostomum Rottleri* Schwaegr. (*Suppl.* t. 3*.) is an East Indian species, with a clavate capsule, and leaves of firmer texture, not bordered. *Bryum attenuatum* of Dickson is *Entosthodon Templetoni. Bryum obtusum* of Dickson is correctly described "capsulis obovatis truncatis, operculo-convexo," and has been unaccountably confounded with *Pottia Heimii.*

279. 2. *Physcomitrium fasciculare* Br. and Sch. (*fallow-field Bladder-Moss*); leaves ovate-oblong, acuminate, or widely lanceolate, serrated, the nerve ceasing below the apex; capsule pyriform; lid convex. (TAB. LII.)

Physcomitrium fasciculare *Bruch and Schimp.* Monogr. p. 13. t. 4. *Hampe. De Notaris.*
Entosthodon fasciculare *C. Müller*, Syn. Musc. i. 120.
Gymnostomum Physcomitrium fasciculare *Bridel*, Bryol. Univ.
Gymnostomum fasciculare *Hedw.* Sp. Musc. t. 4. *Nees and Hornsch.* Bryol. Germ. t. 10. f. 10. *Web. and Mohr. Hartmann.*
Bryum fasciculare *Dicks.* Crypt. iii. p. 3. t. 7. f. 5. (*Herb. Turner.*)

Hab. In fallow fields, chiefly in a clayey soil. Fr. April.

About the size of the next species, with which it has been often confounded. Stems ½ inch long or more, tufted. Leaves narrower than in the next, widely lanceolate, or ovate-oblong, acuminate, serrated, not bordered as in the preceding species, moderately spreading, slightly twisted when dry. Calyptra inflated below, smooth and glossy, closely embracing the capsule, yellowish, split on one side. Capsule smaller, and more gradually tapering into the fruitstalk than in *P. pyriforme.* Lid plano-convex. Spores reddish, punctulate.

This is certainly a distinct species, and is easily distinguished from *P. pyriforme* by the plano-convex lid, and narrower, more evidently serrated leaves. The capsule often presents the rudiments of a peristome.

80. 3. *Physcomitrium pyriforme* Br. and Sch. (*common Bladder-Moss*); stems cæspitose; lower leaves remote, ovate-lanceolate; upper leaves spathulate, or oblong-lanceolate, concave, serrated, nerve ceasing below the apex; capsule roundish-pyriform; lid conical; calyptra erect, many-lobed at the base. (TAB. VII.)

Physcomitrium pyriforme *Br. and Sch.* Monogr. p. 11. t. 2. *Hampe. De Notaris.*

Gymnostomum Physcomitrium pyriforme *Bridel;*—splachnoideum *P. Beauv., Bridel;*—turbinatum *Mich., Rich., Bridel;*—tortipes *Bridel.*

Gymnostomum pyriforme *Hedw.* Sp. Musc. *Turner. Smith,* Eng. Bot. t. 413. *Schwaegr. Funck,* Deutsch. Moose, t. 4. f. 10. *Nees and Hornsch.* Bryol. Germ. t. 10. f. 11. *Web. and Mohr. Hook. and Tayl.*

Pottia pyriformis *Ehrh.*

Bryum pyriforme *Linn. Dill.* Musc. t. 44. f. 6. (ex parte).

Hab. Moist banks and ditches; abundant. Fr. April.

Stems from 3 lines to ½ inch long, growing in more or less extensive patches. Lower leaves spreading, distant, ovate-lanceolate; upper leaves wider and larger, subspathulate, acuminate, denticulate; terminal leaves longer and more erect, all of them concave, denticulate, rather thin and flaccid, pale green; areolæ oblong-hexagonal, large; nerve ceasing near the apex. Fruitstalk about ½ inch long. Capsule erect, roundish-pyriform, larger and more tumid than in the preceding species, constricted when dry below the mouth, which is rather small, reddish when fully ripe. Lid more or less conical, always more prominent than in the preceding species. Calyptra paler, divided at the base into several segments, and retaining an erect position on the ripening capsule. Spores reddish, larger and more granular than those of the preceding species.

81. 4. *Physcomitrium sphæricum* Br. and Sch. (*Dwarf Bladder-Moss*); leaves oval-oblong, subspathulate, concave, spreading, acute, entire, the nerve ceasing very near the apex; capsule on a short fruitstalk, roundish, wide-mouthed; lid large, conical. (TAB. LII.)

Physcomitrium sphæricum *Br. and Sch.* Monogr. p. 10. t. 1. *Hampe. De Notaris.*

Gymnostomum Physcomitrium sphæricum *Bridel.*

Gymnostomum sphæricum *Schwaegr.* Suppl. t. 8. *Wilson,* in Eng. Bot. Suppl. t. 2830.

Hab. On the dried mud of pools. Mere, Cheshire, Sept. 1834, *W. Wilson:* not found in any subsequent year: the only known locality in Britain. F. Sep.—Nov.

Stems scattered, or more or less gregarious, 1—3 lines in length, few-leaved. Leaves pale green, erecto-patent, decurrent at the base, concave, scarcely acuminate, and not very acute, of soft texture; lower ones more distant; upper ones larger, collected into a small tuft. Fruitstalk short, scarcely 2 lines in length, reddish. Capsule roundish, when dry and empty much dilated at the mouth, with an exserted columella; when moist and deprived of the large conical lid, its shape is hemispherical. Calyptra campanulate-subulate, small, not covering half the capsule, divided below into several lobes or segments. Spores reddish, rather large, granular on the surface.

According to Bruch and Schimper, this species varies in the size and shape of the capsule, and in the leaves, which are more or less acuminated. It is one of the rarest of the genus, and is a very distinct species. In size and general aspect it is not much unlike *Pottia truncata.*

SUBORDER XXIII. BARTRAMIEÆ.

61. BARTRAMIDULA *Br. and Sch.*

This genus at present consists of a single dwarfish species, resembling *Bartramia fontana* in miniature, and is chiefly characterised by the smooth capsule, not furrowed when dry; by the absence of a peristome; and by the synoicous flowers.

Stems decumbent at the base, radiculose, with fasciculate branches below the floral apex, as in *Philonotula.*

Leaves in five rows, crowded, erecto-patent, subsecund, imbricated when dry, rather rigid, lanceolate, denticulate, carinate; *areolæ* lax, oblong-hexagonal; *nerve* continued to the apex, or subexcurrent.

Inflorescence synoicous.

Capsules aggregate, on curved fruitstalks, more or less cernuous, globose, of thin soft texture, loosely cellular, not striated, the mouth small. *Peristome* none. *Sporangium* united at the top with the *columella*, forming a closed sac, as in *Hymenostomum. Lid* small, plano-convex or subconical. *Calyptra* small, cucullate, fugacious. *Vaginula* oblong. *Spores* rather large, granular, reddish.

Perennial; growing on loose, black, turfy soil, on the mountains. Name, a diminutive of *Bartramia.*

282. *Bartramidula Wilsoni* Br. and Sch. (*beardless dwarf Apple-Moss*). (TAB. LII.)

Bartramidula Wilsoni *Bryol. Europ.* fasc. 29, 30. *Monogr.* p. 3. t. 1. *Wilson,* in Eng. Bot. Suppl. t. 2919.

Glyphocarpa? cernua *Wilson,* in Lond. Journ. Bot. 1841.

Hab. Conner Hill, near Dingle, Ireland, Oct. 1829, *W. Wilson.* Cwm Bychan, near Harlech, N. Wales, *Rev. T. Salwey.* Glen Dole, Clova Mountains, Scotland, *Mr. A. Croall.* Knockavohila, near Kenmare, Ireland, *Dr. Taylor.*

Fr. October.

A very minute moss, growing in small patches, scarcely ½ inch in height. Stems decumbent at the base, branched at the top, below the flower; branches 2, 3, or more together, short, fascicled, suberect. Leaves ovate-acuminate or lanceolate-acuminate, suberect, slightly secund, the nerve reaching nearly to the apex, or sometimes excurrent; they are minutely denticulate in the upper part, and are composed of rather lax oblong cellules, less strongly papillose on the surface than in other mosses of this family, but sufficiently so to exhibit the peculiar texture which distinguishes all the *Bartramieæ;* perichætial leaves longer than the rest, and more erect. Fruitstalks about 3 or 4 lines in length, often 3 or 4 together, reddish, arcuate. Capsule roundish, subpyriform, with a very short tapering neck, more or less drooping, according to the curvature of the fruitstalk, often quite pendulous, reddish, pale, when dry shining, and slightly rugose, but not striated, its walls thin and somewhat pellucid. Sporangium as in *Bartramia*, much smaller than the cavity of the external theca, to the walls of which it is attached by numerous cellular fibres, and at the base supported by a pedicel of similar structure. Spores reddish, rough on the surface, somewhat larger than those of *Bartramia fontana.* Calyptra small, narrow, whitish, cloven on one side, very fugacious, as in other mosses of this genus.

One of the most beautiful and delicate of mosses, remarkable for its pale, pink, globular, drooping capsules. It has not yet been observed in any other country, and is liable to be overlooked on account of its diminutive size.

62. BARTRAMIA *Hedw.* Apple-Moss.

Perennial, cæspitose mosses, with terminal fructification, growing on rocks, and on the ground, rarely upon the bark of trees, with lanceolate papillose leaves, striated subspherical capsules, and small conico-convex lid.

Stem erect, or decumbent at the base, with innovations from below the floral apex, two or more together; the *branches* either short and subverticillate at the top of the stem, or irregularly scattered, more slender, and elongated.

Leaves disposed in 5 or 8 rows, more or less crowded, larger towards the top of the stem, spreading every way, or subsecund, rather rigid, lanceolate or lanceolate-acuminate, serrated, papillose or muriculate on one or both sides; *areolæ* small, quadrate; *nerve* strong, continued to the apex of the leaf, or excurrent.

Inflorescence terminal, synoicous, monoicous, or dioicous. *Barren flowers* disciform.

Capsule subspherical, furrowed when dry, rather large, erect, or cernuous, rarely pendulous, somewhat obliquely inserted on the fruitstalk, which is usually long and straight, sometimes short and curved. *Peristome* double, single, or entirely wanting; *outer peristome* composed of 16 equidistant lanceolate teeth, resembling those of *Bryum*, erect when dry, converging into a cone when moist; *inner peristome* a membrane with 16 plicæ, divided more than half-way into as many carinate widely lanceolate processes, alternating with the outer teeth, and splitting along the middle, so that the two segments of each process become at length widely divergent; the inner peristome is also sometimes furnished with small intermediate cilia, 1, 2, or 3 together. *Annulus* none. *Lid* small, conico-convex. *Calyptra* small, dimidiate, fugacious. *Spores* rather large, papillose, reddish. *Sporangium* much smaller than the external capsule, attached to its walls by cellular fibres.

The *Bartramieæ* are remotely allied to *Bryum*, and form an intermediate link with the *Oreadeæ.*

Eleven European species of *Bartramia*, exclusive of *Conostomum*, are described in the *Bryologia Europæa:* of these only eight are found in Britain. Name in honour of *John Bartram*, an American botanist and traveller.

SECT. I. *Branches fastigiate; inflorescence monoicous.* PHILONOTULA *Bryol. Eur.*

283. 1. *Bartramia rigida* Bals. et Not. (*rigid Apple-Moss*); stem very short, with recurved somewhat whorled branches; leaves crowded, suberect, straight, lanceolate, sharply serrulate, nerve excurrent; barren and fertile flowers approximated; capsule obliquely cernuous, on an erect fruitstalk; lid conical. (TAB. LII.)

Bartramia rigida *Bals. and De Notaris*, Pugill. 1. *De Notaris*, Syll. Musc. Ital. p. 102. *Br. and Sch.* Monogr. p. 20. t. 11.

Philonotis rigida *Bridel*, Bryol. Univ. ii. 17.

Hab. Shady banks in mountainous situations, in Ireland. By the side of the river in Maghanabo Glen, near Dingle, Oct. 1829, *W. Wilson.* Near Dunkerron, Kenmare; and between Kenmare and Killarney, *Dr. Taylor.* Near Bantry. (*Miss Hutchins*, in *Herb. Turner*, named *Mnium marchicum.*)

Fr. Sept., Oct.

A dwarfish species, resembling the smaller varieties of *B. marchica*, growing in compact tufts. Stems 2—6 lines long, slender, very fragile, red, tomentous, with dark reddish radicles. Branches fasciculate, erect, or slightly recurved. Leaves erecto-patent, straight, rather rigid, ovate-lanceolate or lanceolate, tapering upwards to a narrow point; the margin reflexed and serrated, papillose at the back, and on the strong nerve, which is excurrent; areolæ oblong-quadrate. Fruitstalk about ¾ in. long, reddish. Capsule subspherical, large, at first oblique, subsequently cernuous, reddish-brown, strongly furrowed when dry. Lid convex, apiculate. Peristome double; outer teeth reddish-brown, rather short; inner peristome short, sometimes deficient or rudimentary. Spores reddish.

Bartramia marchica Brid., Hedw., does not appear to have ever been found in Britain. Mr. Drummond's specimens, so called, gathered probably near Cork, belong to *B. rigida*, from which *B. marchica* is essentially distinguished by the dioicous inflorescence; the leaves, also, have the margin quite plane, by which character, and by the very acute perigonial leaves, it may be known from the smaller varieties of *B. fontana.*

SECT. II. *Branches fasciculate; inflorescence dioicous.* PHILONOTIS *Bryol. Eur.*

284 2. *Bartramia fontana* Bridel (*fountain Apple-Moss*); stem elongated; leaves dimorphous, either ovate-acuminate, short, and appressed to the stem, or longer, lanceolate, spreading or secund, obscurely plicated at the base; inner leaves of the perigonium horizontally spreading from a broad cancave base, obtuse, nerveless; capsule of thick texture; teeth of the outer peristome closely barred. (TAB. XXIII.)

Bartramia fontana *Bridel,* Mant. Musc. *Swartz. Turner. Web. and Mohr. Schwaegr. Funck,* Deutsch. Moose, t. 24. f. 6. *Hook. and Tayl. Hartmann. De Notaris. Br. and Sch.* Monogr. p. 18. t. 9.
Philonotis fontana *Bridel.*
Mnium fontanum *Linn. Hedw.* Sp. Musc. *Wahlenb.*
Bryum fontanum *Swartz. Smith,* Eng. Bot. t. 390. *Dill.* Musc. t. 44. f. 2.

var. β. alpina; stem short, more robust; branches densely leafy; leaves ovate-lanceolate, mucronate; fruitstalks shorter.
Philonotis fontana γ. alpina *Bridel.*

var. γ. falcata; branches curved at the apex; leaves falcato-secund, yellowish, with a thick reddish nerve.
Philonotis fontana ζ. falcata *Bridel.*
Bartramia falcata *Hook.* in Linn. Trans. vol. 9. p. 317. (partly).

var. δ. pumila; stem short, very slender; leaves small, narrow; capsule small.
Bartramia fontana β. pumila *Turner,* Musc. Hib. p. 107. t. 10. f. 1.

Hab. In wet places, especially near springs; more frequent in mountainous countries. Fr. June.

Growing in dense, extensive, yellowish or glaucous-green patches. Stems 1—6 inches long, or more, matted together and tomentous with blackish or reddish radicles, varying considerably in the ramification, and in the form and direction of the leaves, the branches and innovations sometimes disposed in a stellate manner, sometimes erect, slender or robust, usually fasciculate. Leaves mostly ovate-acuminate, concave, erecto-patent, obscurely plicate at the base, bluntly toothed or serrated; the margin recurved below, papillose at the back; nerve subexcurrent, or sometimes ceasing below the apex; the leaves of the branches are narrower than those of the stem. Fruitstalk long, and of considerable tenacity. Capsule large, of stout, thick texture, curved and longitudinally furrowed when dry, reddish-brown. Teeth of the peristome closely barred; inner peristome, with cilia, 2 or 3 together. Spores rather large, reddish. Inner perigonial leaves obtuse, the nerve scarcely visible and always ceasing below the apex. by which character this species is distinguished both from *B. marchica* and from *B. calcarea.*

The var. δ. *pumila* is considered by Bruch and Schimper to be a mere accidental form of the species, growing in sandy or in less humid situations. The original specimen appears to be absent from Mr. Turner's *Herbarium*, but we have seen fertile specimens gathered by Mr. Drummond, in moist shady places on the banks of the Isla, and others from a sand pot in the Conservatory of the Botanic Garden at Edinburgh, which may prove to be distinct from *B. fontana*, differing in the much smaller size, slender habit, and lax foliage; the leaves narrowly ovate-lanceolate, acuminate, of thinner texture, less opaque, more evidently papillose; nerve excurrent; margin slightly reflexed. No barren plants accompanied the specimens, but we have seen what we consider to be such, gathered in Sussex and elsewhere, having the perigonial leaves acute, and nerved almost or quite to the apex. Barren specimens have been found at Worsley, near Manchester, and a more robust state of this variety was gathered in Den-na-Rechip, Scotland, by Mr. Borrer, assumed to be *B. marchica* in *Eng. Bot.* t. 2074.; but the figure and description there given chiefly belong to East Indian specimens of *B. falcata* Hooker, or (which appears to be the same species) of *B. marchica*, having the leaves carinate, with plane, not reflexed, margins.

A still more diminutive form of *Bartramia* has been gathered in Campbell Glen, near Dollar, Perthshire, by Mr M'Ivor, having the stem and branches very short; leaves much crowded, subsecund, gradually tapering from the base; nerve scarcely excurrent: of this, also, the barren plant is wanting, and we are compelled to regard both these varieties as states of *B. pumila.*

B. Muhlenbergii of Schwaegrichen (*Suppl.* t. 61.) appears to be only an American form of *B. marchica*, with shorter branches than usual. *B. sphærocarpa* Hedw. is a different species, with monoicous inflorescence.

285. 3. *Bartramia calcarea* Br. and Sch. (*thick-nerved Apple-Moss*); dioicous; stem elongated; leaves crowded, secund, rigid, ovate-lanceolate, gradually tapering, concave, strongly nerved, margin plane; perigonial leaves tapering, very acute, nerved to the apex; teeth of the peristome remotely barred. (Tab. LII.)

B. calcarea *Br. and Sch.* Monogr. p. 19. t. 10.
B. falcata (partly) in *Herb. Hook.* (the European specimen).

Hab. Wet places, chiefly in limestone districts. Teesdale, *Mr. Spruce.* Highlands of Scotland, *Mr. Edmonston.* Hale Moss, Cheshire, barren, *W. Wilson.* Near. Todmorden, *Mr. Nowell.* Fr. July.

Growing in dense patches, of a more pure and intense green colour than the preceding species. Leaves longer, more rigid, gradually tapering to a point, secund; the margin not reflexed (*fig. m.l.*), less papillose; areolæ larger; nerve stronger. In addition to these characters, the species is known by the perigonial leaves (see *figs.* 4, 5.).

SECT. III. *Stem dichotomously branched.* BARTRAMIA *Bryol. Eur.*

* Inflorescence monoicous.

286. 4. *Bartramia pomiformis* Hedw. (*common Apple-Moss*); monoicous; dichotomously branched, branches fastigiate; leaves crowded, spreading, crisped when dry, linear-lanceolate, serrated, scabrous; capsule cernuous, subspherical. (TAB. XXIII.)

Bartramia pomiformis *Hedw.* Sp. Musc. *Schwaegr.* Suppl. t. 58. *Turner. Smith,* Eng. Bot. t. 998. *Hook.* in Fl. Lond. ed. 2. (with a figure). *Funck,* Deutsch. Moose, t. 24. f. 1. *Bridel. Hook. and Tayl. Br. and Sch.* Monogr. p. 13. t. 4.

Webera pomiformis *Hedw.* Fund. Musc.

Bryum pomiforme *Linn. Dill.* Musc. t. 44. f. 1.

Bartramia vulgaris *Mougeot and Nestler,* No. 137.

Bartramia crispa var. minor *Wahlenb. Hartmann. Web. and Mohr.*

var. β. crispa; leaves longer, less crowded; branches often longer than the fruitstalks, slender.

Bartramia crispa *Swartz,* Musc. Suec. *Hook.* in Fl. Lond. ed. 2. (with a figure). *Turner,* Eng. Bot. t. 1526. *Schwaegr.* Suppl. t. 59. *Funck,* Deutsch. Moose, t. 24. f. 2. *Hartmann. Bridel.*

B. crispia var. major *Hook. and Tayl.*

Hab. On dry shady banks, in a sandy soil; var. β. in the fissures of subalpine rocks. Fr. May.

Stems densely tufted, glaucous-green, ½—2 inches in length. Leaves crowded, more or less spreading, straight or incurved, more or less crisped or tortuous when dry, linear-lanceolate, narrow and tapering, flattish, the border tumid, with a double row of spinulose serratures; nerve subexcurrent. Barren and fertile flowers gemmiform, contiguous. Fruitstalk about an inch long. Capsule cernuous or inclined, subglobose, reddish-brown, furrowed when dry, as in all others of the genus. Lid small, subconical. Peristome double; inner peristome shorter than the outer teeth, with or without cilia.

The smaller variety sometimes approaches in aspect to *B. stricta* Brid., which differs in the synoicous inflorescence and single peristome; the var. β. resembles *B. Halleriana*, but differs in having long fruitstalks, and leaves not dilated nor sheathing at the base.

87. 5. *Bartramia Halleriana* Hedw. (*Haller's Apple-Moss*); monoicous; stem elongated; branches irregular, subfastigiate; leaves spreading from an erect dilated pale sheathing base, linear-subulate, serrated, nerve excurrent; fruitstalk shorter than the leaves, slightly curved. (TAB. XXIII.)

Bartramia Halleriana *Hedw.* St. Crypt. ii. t. 40. *Turner. Smith,* Eng. Bot. t. 997. *Funck,* Deutsch. Moose, t. 24. f. 7. *Schwaegr. Web. and Mohr. Hook. and Tayl. Bridel. Hartmann. Br. and Sch.* Monogr. p. 14. t. 5.

Webera Halleriana *Hedw.* Musc. Fund.
Bryum laterale *Dickson. Swartz.*
B. pendulum *Flora Danica.*
B. norvegicum *Oeder. Gunn.*

Hab. Moist alpine or subalpine rocks. Fr. June, July.

Growing in soft lax tufts, of a bright or yellowish-green colour. Stem 1—3 inches long or more, usually with fastigiate branches, tomentous, with dark brown radicles in the lower part. Leaves very long and slender, widely spreading every way, or subsecund; dilated, erect, and slightly sheathing at the base, which is pale and somewhat shining, linear-subulate, or setaceous in the upper part, somewhat tortuous or crisped when dry, roughish on both sides, the margin serrulate. Inflorescence as in the preceding species. Fruitstalk about 2 lines in length, curved, sometimes two or three together. The fruit appears to be lateral in consequence of the growth of the innovations, which are usually solitary, but the flowers when examined at an early stage are truly terminal.

** Inflorescence synoicous.

288. 6. *Bartramia Oederi* Swartz (*Oeder's Apple-Moss*); synoicous; stem irregularly branched, branches fastigiate; leaves remote, recurvo-patent from an erect base, lanceolate, carinate, smooth, serrated at the apex; capsule globose, oblique, small. (Tab. XXIII.)

Bartramia Oederiana *Swartz,* in *Schrader* Journ. 1800.
Bartramia Oederi *Schwaegr.* Suppl. t. 59. *Web. and Mohr. Funck,* Deutsch. Moose, t. 24. f. 3. *Bridel. Hartmann. Br. and Sch.* Monogr. p. 12. t. 3.
Bartramia gracilis *Floerke,* in *Schrader* Journ. 1799. *Smith,* Eng. Bot. t. 1826. *Hook. and Tayl.* tab. xxiii.
B. longiseta *Brid.* Meth.
B. grandiflora *Ib. Schwaegr.* Suppl. t. 58.

var. β. condensata Bridel; stems compactly tufted, tomentous, more slender.

Hab. Moist, shady rocks, especially such as are calcareous. Fr. May.

Growing in lax, soft, extensive patches of a dark green colour. Stem slender, radiculose, 1—3 inches long. Leaves spreading every way and recurved; erect, but not sheathing nor suddenly dilated at the base, shorter than in other British species, crisped when dry, lanceolate, sharply keeled; the margin recurved, not sensibly papillose on the surface, serrated at the apex; nerve subexcurrent. Fruitstalk scarcely ½ inch long. Capsule small, suberect, oblique, the mouth proportionably large. Lid plano-convex. The name *Oederi* is here retained in deference to Bruch and Schimper, but the reason for rejecting the more ancient one imposed by Floerke is not apparent.

289. 7. *Bartramia ithyphylla* Bridel (*straight-leaved Apple-Moss*); synoicous; stem dichotomous, branches fastigiate; leaves spreading from a dilated pale erect sheathing base, lanceolate-

subulate, rigid, straight when dry, subserrulate, nerve broad and predominant; capsule oblique; processes of the inner peristome imperfect. (TAB. XXIII.)

Bartramia ithyphylla *Bridel*, Mant. Musc. and Bryol. Univ. *Eng. Bot.* t. 1710. *Schwaegr.* Suppl. t. 60. *Funck*, Deutsch. Moose, t. 24. f. 4. *Hook. and Tayl. De Notaris. Hartmann. Br. and Sch.* Monogr. p. 11. t. 2.
Bartramia pomiformis *Wahlenb.* Fl. Lap.

Hab. Alpine and subalpine rocks. Common on the mountains of Scotland and Wales. Near Todmorden, Lancashire, *Mr. Nowell.* Fr. June.

Stems more or less compactly tufted, ½—2 inches or more in length; branches fastigiate. Leaves rigid, straight when dry, bright or yellowish green, subulato-setaceous, more or less spreading from the dilated pale sheathing base, by which character, and by the broad predominant nerve, this species is easily distinguished from every other British species. Fruitstalk about an inch long.

SECT. IV. *Leaves plicate, sheathing at the base; branches fasciculate; inflorescence dioicous.* BREUTELIA *Bryol. Eur.*

290 8. *Bartramia arcuata* Bridel (*curve-stalked Apple-Moss*); stem elongated; branches fasciculate, or verticillate; leaves widely spreading from a broad sheathing base, ovate-lanceolate, plicate, scabrous, serrulate in the margin; capsules subpendulous; fruitstalk short, arcuate. (TAB. XXIII.)

Bartramia arcuata *Bridel*, Mant. Musc. &c. *Schwaegr.* Suppl. t. 62. 240. *Turner. Smith*, Eng. Bot. t. 1237. *Hook. and Tayl. Br. and Sch.* Monogr. p. 15. t. 6.
Mnium arcuatum *Dickson*, Crypt. Fasc. 3. t. 7. f. 3.
Hypnum chrysocomum *Dicks.* Crypt. Fasc. 2. p. 12. *Dill.* Musc. t. 39. f. 36.
Mnium chrysocomum *Hedw.* Sp. Musc.

Hab. On wet rocks, rare in fruit. Abundant at Lowdore Waterfall, near Keswick. In fructification at Lidford Fall, Devon, *Dr. Greville;* and at Cromagloun, near Killarney, Ireland, *W. Wilson.* Sparingly in fruit by Llyn Ogwen, Caernarvonshire. Near Beddgelert. Trosachs, near Callander, *Mrs. Robertson.* Fr. Sept., Oct.

Growing in extensive yellowish-green patches. Stems 2—4 inches long and more, densely covered with reddish-brown radicles. Leaves ovate-lanceolate, plicate, shining, sheathing and erect at the base, thence widely spreading, not much altered when dry; the margin nearly plane, serrulate; nerve subexcurrent. Barren-flowered plant with a terminal large discoid flower, not often producing more than one innovation below the flower; antheridia numerous, with subclavate paraphyses. Fruitstalk about twice or thrice the length of the capsule, arcuate or geniculate, rather thick, red. Capsule subglobose, certainly furrowed when dry, not smooth as stated in *Musc. Brit.*, though it is nearly or quite so when recent, its texture thin and bladdery, much larger than the sporangium, reddish-brown when fully ripe, at first pale yellowish-brown. Inner peristome sometimes with cilia 1—3 together.

63. CONOSTOMUM *Swartz.* Cone-fringe Moss.

A genus closely allied to *Bartramia*, from which it principally differs in the structure of the peristome, rostellate lid, and larger, less fugacious calyptra.

Capsule cernuous, subglobose, obscurely furrowed when dry. *Annulus* none. *Lid* conical, rostellate, or rostrate. *Calyptra* cucullate, larger and less fugacious than in *Bartramia. Peristome* single; *teeth* 16, equidistant, longer than in *Bartramia*, linear-lanceolate, transversely barred, all united together at their apices, and thus converging into a cone. *Spores* large, brown.

Stems compactly tufted, radiculose; *branches* fastigiate, slender, fragile.

Leaves in five rows, lanceolate-acuminate, sharply carinate, serrulate, or entire; *nerve* excurrent; *areolation* as in *Bartramia.*

Inflorescence dioicous. *Barren flower* subdiscoid; *antheridia* mixed with subclavate paraphyses; *archegonia* with long styles.

Perennial, growing in bleak alpine situations. Three species are known, only one of them indigenous to Europe. Name from *κονος, a cone,* and *στομα, mouth;* in allusion to the peristome.

291 *Conostomum boreale* Swartz (*northern Cone-fringe Moss*); stems compactly cæspitose, irregularly branched, radiculose below; branches fastigiate, with the imbricated foliage pentagonal; leaves imbricated in five rows, lanceolate-acuminate or mucronate, sharply carinate, serrated, nerve excurrent; capsule cernuous, roundish, gibbous; lid rostellate. (Tab. X.)

Conostomum boreale *Swartz*, in *Schrad.* Journ. 1806. (with a figure). *Schwaegr.* Suppl. t. 21. *Wahlenb. Nees and Hornsch.* Bryol. Germ. t. 13. *Bridel. Hook. and Tayl.*
Grimmia conostoma *Smith*, Eng. Bot. t. 1135.
Bryum tetragonum *Dicks.* Crypt. Fasc. 2. t. 4. f. 9.
Bartramia conostoma *Br. and Sch.* Monogr. Bartram. p. 16. t. 7.

Hab. Summits of the Scottish mountains, not unfrequent. Not seen on any of the Welsh mountains. Fr. Aug., Sept.

Stems ½—2 inches long, very compactly tufted, and held together by interlacing fibrous radicles, fragile. Leaves erect, scarcely altered when dry, somewhat glaucous-green, lower leaves brownish and discoloured. Fruitstalk ½—1 inch long. Lid nearly half as long as the capsule. Peristome deep red.

Conostomum australe, another species, differs in the narrow, tapering, almost entire, bristle-pointed leaves, with a broad nerve, and in the longer rostrate lid.

SUBORDER XXIV. OREADEÆ.

The type of this small group of Mosses is *Oreas Martiana* of Bridel (*Weissia Martiana* Hornsch.), not found in Britain. The genus *Oreas* named in allusion to the alpine habitat.

64. CATOSCOPIUM *Bridel.*

WEISSIA (partly) *Hook. and Tayl.*

The only species of this genus is remotely allied in habit to *Dicranum*, and to *Bartramia*, and is remarkable for its peculiar capsule.

Stems slender, more or less compactly tufted, with innovations from below the floral summit, dichotomous or irregularly branched, radiculose.

Leaves in eight rows, lanceolate, carinate, nerved, spreading, somewhat recurved; *areolæ* small, quadrate, opaque.

Inflorescence dioicous. *Flowers* terminal: *barren flowers* gemmiform; *antheridia* small, with filiform paraphyses: *fertile flowers* with few archegonia and no paraphyses.

Capsules solitary, on an elongated fruitstalk, small, roundish, horizontal, its suddenly bent neck tapering into the fruitstalk, smooth, shining, of thick almost horny texture, the mouth somewhat oblique. *Annulus* none. *Lid* small, more or less conical. *Calyptra* small, cuculliform, smooth, fugacious, sometimes remaining attached to the fruitstalk, as in *Discelium*. *Peristome* single; *teeth* 16, short, lanceolate or truncate, irregular, transversely barred, and marked with a medial line, scarcely hygroscopic. There are sometimes obscure traces of an inner peristome. *Spores* large, smooth.

Perennial; growing in subalpine marshy places, and on wet rocks.

In the form of the capsule this genus is nearly allied to *Discelium*, but in general habit it more resembles *Oreas*. Name from κατω, *downwards*, and σκοπεω, *to look;* from the appearance of the capsule.

92. *Catoscopium nigritum* Bridel (*lurid Apple-Moss*). (TAB. XIV.)

C. nigritum *Bridel*, Bryol. Univ. i. 368. *Nees and Hornsch.* Bryol. Germ. t. 42. *Br. and Sch.* Monogr. p. 4. t. 1.

Weissia nigrita *Hedw.* St. Crypt. iii. t. 39. *Bridel. Schwaegr. Funck*, Deutsch. Moose, t. 10. f. 13. *Hook. and Tayl.* tab. xiv. *Wahlenb.*

Grimmia nigrita *Smith*, Eng. Bot. t. 1825.

Bryum nigritum *Dickson.*

Hab. Moist alpine rocks, and marshy places; rare. Plentiful on Ben-y-gloe, near Blair, in Athol. Sands of Barry, near Dundee, *G. Don.* Widdy Bank, Teesdale, *Mr. Borrer* and *John Nowell.* Fr. March?

Growing in soft green tufts. Stems 2—6 inches long or more, reddish-brown in the lower part, slender and filiform, flexuose, beset with brownish radicles. Leaves not much crowded, erecto-patent, lanceolate, acute, carinate, terminal ones longer than the rest, margin reflexed, entire; nerve ceasing at or near the apex; lower cellules of the leaf larger than the rest. Capsule small, roundish, cernuous, shining, chestnut-coloured, blackish when old, not altered when dry, of hard, brittle, unyielding texture. (See the description of the genus for further details.)

SUBORDER XXV. DISCELIEÆ.

65. DISCELIUM *Bridel.*

WEISSIA (partly) *Hook. and Tayl.*

Only one species of this suborder and genus is known: in the mode of growth it is analogous to *Phascum*, in the capsule to *Catoscopium,* and in the peristome to *Trematodon.*

Plants annual, almost stemless, gemmiform, growing from a green velvety conferva-like thallus. *Leaves* few, imbricated, concave, entire, ovate-lanceolate, almost destitute of nerve; *areolæ* lax, oblong-hexagonal, diaphanous.

Flowers disjoined, but apparently springing from the same fibrous rhizoma, gemmiform. *Barren flowers* smaller and shorter than the fertile; *antheridia* few, oblong, shortly pedicellate, mixed with subclavate paraphyses; *archegonia* rather thick, without paraphyses.

Capsule on an elongated, flexuose, succulent fruitstalk, subglobose, cernuous, decurrent into the suddenly bent neck, of thick, succulent, cellular texture. *Annulus* large, subpersistent. *Lid* large, conical. *Calyptra* narrow, subulate, smooth, split on one side throughout its whole length, fugacious, or attached to the fruitstalk below the capsule. *Vaginula* oblong. *Peristome* single; *teeth* 16, lanceolate, solid, transversely barred and jointed, cloven or perforated half-way or more from the base upwards, red, scarcely hygroscopic. *Sporangium* contiguous to the walls of the capsule. *Spores* of moderate size, punctulate, reddish.

Growing on clayey banks; gregarious. Name from δις, *twice*, and σκηλος, *leg;* the teeth being split into two divisions from the base to the middle.

293. *Discelium nudum* Bridel (*naked Apple-Moss*). (TAB. XIV.)
D. nudum *Bridel*, Bryol. Univ. i. 366. *Br. and Sch.* Monogr. p. 4. t. 1.

Weissia nuda *Hook. and Tayl.* tab. xiv.
W. rosea *Wahlenb.* Fl. Lap. t. 19.
Weissia incarnata *Schwaegr.* Suppl. t. 18.
Grimmia nuda *Smith,* Eng. Bot. t. 1421. *Turner.*
Coscinodon nudus *Bridel,* Meth.
Bryum nudum *Dicks.* Crypt. Fasc. 4. t. 10. f. 15.

Hab. On clayey declivities in the north of England and Scotland. First discovered by Mr. George Cayley, near Manchester; since found in many situations in the same neighbourhood. Fr. Feb., March.

During the autumn, the clayey declivities where this moss grows are covered with the green velvety thallus, which withers or becomes discoloured after the formation of the fruit, and very frequently falls down, by the action of the winter frosts, along with the substratum, which thus presents annually a new surface favourable for the propagation of this singular moss, which much resembles a *Phascum* in its mode of vegetation. Leaves none, except those which constitute the floral envelope, 6 or 8 in number, imbricated and nearly erect, the uppermost ovate-lanceolate, loosely cellular, and almost pellucid, pale reddish when old, entire and usually destitute of nerve, or the nerve very faint and obscure. Fruitstalk about an inch long, flexuose, reddish. Capsule subglobose, reddish, more or less cernuous. Calyptra somewhat longer than the capsule, at first subulate, spirally torn by a single fissure, extending nearly to the apex, frequently entire at the base, which thus remains attached to the fruitstalk. Lid conical, large, more or less acute. Annulus composed of a double row of cellules. Vaginula not quite covered by the leaves, oblong, not much thicker than the fruitstalk.

SUBORDER XXVI. SPLACHNEÆ.

66. SPLACHNUM *Br. and Sch.* Collar-Moss.

SPLACHNUM (partly) *Hook. and Tayl.*

Capsule ovate-oblong or subcylindrical, with a large, spongy, differently coloured apophysis, exceeding in size the ripe sporangium, and in some species much dilated, on an elongated succulent fruitstalk. *Calyptra* small, conical, entire, or irregularly lacerated at the base. *Lid* convex or mammillate. *Peristome* single; *teeth* 16, approximated or cohering in pairs, strongly reflexed when dry, and appressed to the capsule, converging and incurved when moist, lanceolate-oblong, obtuse, plane, rather large, yellowish, composed of a double layer of cellules, lined at the back with a very thin cellular membrane. *Columella* usually exserted when dry, dilated at the apex. *Spores* small, yellowish-brown, arranged in radiating lines around the columella. *Vaginula* short, ovate, crowned by a laciniated membrane.

Stem with innovations from below the floral apex, dichotomous, of succulent soft texture, rooting at the base and from the axillæ of the branch-leaves.

Leaves remote, in five rows, lower ones smaller, upper ones crowded into a lax tuft, narrow at the base, dilated upwards, terminating in a tapering point of greater or less length, entire or irregularly denticulate; the *nerve* thin, ceasing near the apex; *areolæ* lax, oblong-hexagonal.

Inflorescence dioicous, rarely monoicous. *Barren-flowered plants* or *branches* slender, with small scattered leaves, or naked, terminated by the capituliform, spreading perigonium, consisting of few leaves, concave at the base, tapering above. *Antheridia* numerous, fusiform, curved, mixed with subclavate paraphyses. *Fertile flowers* 3-leaved, mostly destitute of paraphyses.

The species of this genus are remarkable for their soft, succulent, spongy habit, their large, tender, loosely reticulated leaves, much contracted when dry, and for the large spongy apophysis. They grow on the dung of herbivorous animals, in a loosely cæspitose manner, and are perennial.

The genus *Splachnum* is distinguished from *Tetraplodon* (according to Bruch and Schimper) in the following manner. The whole plant is more tender and succulent; leaves of more lax texture; the spongy or vesicular apophysis continues to increase in size after the capsule is ripe, and differs both in colour and in texture from the capsule itself; calyptra conical, rarely split on one side only; peristome of somewhat different structure; barren flowers of different form; growing in less compact tufts, in low marshy, not dry and elevated, situations, on the dung of herbivorous animals only.

In almost all, or perhaps all the *Splachneæ*, claviform bodies are found in the axillæ of the terminal leaves of the fertile stem, bearing some resemblance to antheridia, for which they have sometimes been mistaken; but in structure they are more analogous to paraphyses.

The genus *Splachnum*, as defined and limited by Bruch and Schimper, includes *Aplodon* of Brown, and *Eremodon* of Bridel. Six species are described in the *Bryologia Europæa*. The name (σπλαγχνον) is borrowed from Dioscorides, and was originally used for some lichen or cryptogamic plant.

294. 1. *Splachnum vasculosum* Linn. (*large-fruited Collar-Moss*); dioicous; stem more or less elongated, simple, or with fasciculate branches; leaves ovate-acuminate, or roundish-ovate, obtuse, very narrow at the base, entire; capsule cylindrical, with a large globular apophysis; lid hemispherical. (TAB. XXI.)

Splachnum vasculosum *Linn.* Sp. Pl. ed. 2. p. 1572. (excl. syn. *Buxb.*) *Hedw.* St. Cr. ii. t. 15. *Schwaegr. Greville*, Scot. Crypt. Fl. t. 179. *Hook. and Tayl. Wahlenb. R. Brown. Br. and Sch.* Monogr. p. 11. t. 7.

Splachnum rugosum *Dickson*, Crypt. Fasc. 4. t. 10. f. 7. *Smith*, Eng. Bot. t. 2094.

Splachnum vasculosum var. acutifolia, *Grev.* Scot. Crypt. Fl. t. 311.

Hab. In wet places, near springs, &c., in the more elevated parts of the Highland mountains. Ben More, in Glen Dochart. Ben Lawers. Clova mountains. Fr. July.

Growing in extensive, lax, dark or pale green patches. Stems an inch long or more, beset with purplish radicles in the lower part, and in the axillæ of the branch-leaves. Leaves mostly roundish-ovate, large, more or less obtuse or acute, concave, entire, the nerve ceasing below the apex. Fruitstalk about an inch long, reddish. Capsule erect, cylindrical, subtended by a large, globular, dark purple apophysis, and constricted below the mouth when dry. Peristome shorter than in the next species, inserted lower down within the orifice of the capsule; the spores rather larger. The apophysis is smooth while recent, but occasionally becomes rugose when dry.

Splachnum ovatum Dickson, and *S. heterophyllum* Hook. (in *Drum. Musc. Am.* 37.), if not specifically distinct, belong to *S. vasculosum*, rather than to *S. sphæricum.*

95. 2. *Splachnum ampullaceum* Linn. (*flagon-fruited Collar-Moss*); monoicous or dioicous; leaves obovate-lanceolate, or oblong-lanceolate, acuminate, serrated; capsule oblong, with an inversely flagon-shaped apophysis, much dilated below the capsule; lid conico-convex; fruitstalk very narrow at the base. (Tab. IX.)

Splachnum ampullaceum *Linn.* Sp. Pl. p. 1572. *Hedw.* St. Cr. ii. t. 14. *Turner. Schwaegr. Smith*, Eng. Bot. t. 144. *Funck*, Deutsch. Moose, t. 7. f. 8. *Web. and Mohr. Hook. and Tayl. Br. and Sch.* Monogr. p. 10. t. 6.

S. Turnerianum *Dicks.* Crypt. Fasc. 4. t. 10. f. 11. *Smith*, Eng. Bot. 1116. *Bridel*, Meth. *Dill.* Musc. t. 44. f. 3.

Hab. In turbaries, growing on the dung of herbivorous animals; less frequent on the mountains than in low situations. Fr. May, June.

Stems about an inch long, the foliage more or less crowded. Lower leaves lanceolate; upper leaves twice as large or more, obovate or oblong-lanceolate, acuminate, more or less toothed or serrated, or entire; areolæ lax; nerve ceasing at or near the apex. Fruitstalk an inch long or more, very slender at the base, purplish, more deeply coloured near the apophysis, which is often very pale where it joins the fruitstalk. Apophysis widely turbinate, tapering below, much wider than the capsule, hollow, and inflated, pale purple or red. Peristome inserted below the mouth of the capsule. Spores small, yellowish. Capsule constricted below the mouth when dry.

Splachnum ampullaceum, while drying, exhales an odour similar to that of newly-tanned leather: it is one of the most beautiful and curious of British mosses. *S. Turnerianum* is a slender form of the species, with a narrow apophysis; not a permanent variety.

3. *Splachnum sphæricum* Hedw. (*round-fruited Collar-Moss*); dioicous; leaves spreading, obovate-acuminate, entire or slightly serrated, nerved to the apex; capsule subcylindrical, with a roundish-ovate apophysis; lid mammillate; peristome half as long as the capsule; fruitstalk elongated, flexuose. (TAB. IX.)

Splachnum sphæricum *Hedw.* St. Cr. ii. t. 16. *Linn.* fil. Meth. Musc. t. 1. f. 1. *Schwaegr. Swartz. Wahlenb. Smith*, Eng.Bot. t. 785. *Bridel. Hook. and Tayl. Br. and Sch.* Monogr. p. 8. t. 5.

Splachnum ovatum *Hedw.* Sp. Musc. t. 8. *Schwaegr. Turner. Smith*, Eng. Bot. t. 1590. *Bridel*, Meth. Bryol. Univ. (scarcely of *Dickson*).

Splachnum gracile *Dickson*, Crypt. Fasc. 4. t. 10. f. 5. *Smith*, Eng. Bot. t. 1921. *Schwaegr.* Suppl. t. 15. *Funck*, Deutsch. Moose, t. 7. f. 9. *Bridel. Dill.* Musc. t. 44. f. 4.

Hab. In moist places in turbaries, and in alpine situations on the dung of animals. Fr. May, June.

Growing in lax, deep-green tufts. Stems ½—1 inch long, soft and succulent. Lower leaves smaller and more scattered than the upper ones, all of them roundish-obovate, acuminate, entire, or obsoletely toothed in consequence of the prominence of the marginal cellules; nerve ceasing at or very near the apex; areolæ roundish or oblong-hexagonal. Fruitstalk more or less elongated, slender, flexuose, reddish. Capsule subcylindrical. Apophysis somewhat wider than the capsule, ovato-globose, spongy within, not inflated, shining, dark-purple, rugose when dry. Teeth of the peristome yellowish, longer than in the preceding species, at first cohering in pairs, subsequently disunited, each marked with a medial line, sometimes perforated, when dry strongly deflexed and appressed to the capsule. Columella exserted when dry, capitate. Spores small, greenish. Calyptra small, fugacious, pale, entire, or laterally cloven. This species is liable to much variation in the leaves, in the length of the fruitstalk, and in the colour of the apophysis. *S. intermedium* of Drummond's *Musci Americani*, No. 39., is considered by Bruch and Schimper to be only a variety of this species with a somewhat smaller peristome. *S. heterophyllum* Hooker, of the same collection, No. 37., is probably a distinct species, with a much smaller, more immersed peristome, short fruitstalk, and obtuse leaves, resembling those of *S. vasculosum*, to which it is very nearly allied. Dickson's *S. ovatum* (in *Herb. Turner*) is exceedingly like *S. heterophyllum*, except that the leaves are slightly apiculate, and may belong to the same species.

67. TETRAPLODON *Br. and Sch.*

SPLACHNUM (partly) *Hook. and Tayl.*, *&c.*

Capsule on a tough fruitstalk of moderate length, small, subcylindrical, with a solid clavate or oval apophysis, of the same colour, and somewhat wider than itself. *Calyptra* small, cucullate. *Lid* conico-convex, obtuse. *Peristome* single, composed of 16 double teeth, at first approximated in fours, subsequently in pairs, each pair united at the base, reflexed when dry, converging and incurved when moist, much shorter than the capsule. *Columella* not dilated at the apex, nor exserted when dry. *Spores* small, greenish, disposed in radiating lines around the columella.

Stems dichotomous, densely tufted, perennial; *branches* fastigiate.

Leaves in five rows, widely lanceolate or obovate-acuminate, concave, entire, or obscurely serrated, rather loosely reticulated, nerved nearly or quite to the apex.

Inflorescence monoicous. *Barren flowers* gemmiform or capituliform, axillary and sessile, or terminal on a lateral branch, 3—5 leaved; *antheridia* rather numerous, mixed with subclavate paraphyses. *Fertile flower* 3-leaved; *archegonia* few, without paraphyses.

The genus *Tetraplodon* is separated by Bruch and Schimper from *Splachnum* on account of the more compactly tufted growth and longer duration of the plants; the almost gemmiform barren flowers; the uniform colour and consistence of the capsule and its apophysis, which does not increase in size after the period of maturity; the tenacious fruitstalk not elongated after the formation of the capsule; the more dense cellular tissue of the leaves; and the habitat on animal substances, or on the dung of carnivorous animals. The name *Tetraplodon* refers to the fourfold arrangement of the teeth of the peristome, when first visible on the removal of the lid, from τετραπλοος, *fourfold*, and οδων, *tooth*.

In the mode of ramification, *Tetraplodon* resembles *Tayloria* and *Dissodon*, the innovations arising in pairs immediately below the floral apex, and of equal length. Three species are described in the *Bryologia Europæa*.

297. 1. *Tetraplodon mnioides* Br. and Sch. (*brown-tapering Collar-Moss*); stems densely tufted; leaves erecto-patent, somewhat imbricated, elliptic-oblong, or obovate, acuminate, very concave, entire, nerved to the apex; apophysis obovate, or clavate, scarcely wider than the capsule; lid conical, obtuse; teeth of the peristome in eight pairs. (TAB. IX.)

Tetraplodon mnioides *Bryol. Europ.* Monogr. p. 5. t. 2.

Splachnum mnioides *Linn.* fil. *Hedw.* St. Cr. ii. t. 11. *Schwaegr.* *Bridel.* *Funck*, Deutsch. Moose, t. 7. f. 2. *Smith*, Eng. Bot. t. 1589. *Web. and Mohr.* *Hook. and Tayl.*

Splachnum urceolatum *Dicks.* Crypt. Fasc. 2. p. 2. *Smith*, Eng. Bot. t. 2417. *Hedw.* St. Crypt. ii. t. 13. (fide *Br. and Sch.*) *Wahlenb.*

Splachnum arcticum *R. Brown,* Flor. Ins. Melv. t. 301. (fide *Br. and Sch.*)
S. propinquum, exsertum, paradoxum *R. Brown,* Ibid. (fide *Br. and Sch.*)
S. adamsianum *Schwaegr.* Suppl. t. 178. (fide *Bruch and Schimp.*)
S. purpureum *Withering.*
Phascum mnioides *Linn.* Meth. Musc. *Dill.* Musc. t. 44. f. 5.

var. β. Brewerianus; branches slender; leaves narrower and more distant, widely lanceolate, spreading.
Splachnum Brewerianum *Hedw.* St. Cr. ii. t. 38. *Schwaegr. Bridel.*
Splachnum fastigiatum *Dickson.* *Smith,* Eng. Bot. t. 786.

Hab. In moist situations, chiefly on the mountains of England, Scotland, or Ireland, on dung, or on decayed animal substances. On Woolston Moss, near Warrington, and Delamere Forest, Cheshire. Fr. May.

Stems ½—3 inches long, densely tufted. Leaves more or less crowded, suberect, and loosely imbricated, somewhat obovate, or elliptical; suddenly attenuated, almost piliferous above, very concave below; entire, the nerve subexcurrent, areolæ lax. Fruitstalk about an inch long, firm and tenacious, rather thick, shining, at first yellow, subsequently reddish. Capsule oval, dark-red or blackish when fully ripe, constricted below the mouth when dry. Apophysis at first green, narrower than the capsule, subsequently rather wider and longer, and of the same colour, sprinkled with numerous pale cuticular stomata. Peristome inserted below the orifice of the capsule; teeth reddish-brown, solid, at first 4 together, subsequently in pairs, reflexed when dry. Spores small, greenish or brown, in an unripe state disposed in radiating lines around the columella, but less conspicuously so than in *Splachnum sphæricum.* Calyptra twice as long as in that, dimidiate.

The apophysis in this species varies in size, and is sometimes narrower than the capsule; the leaves also are variable. From the variety with very concave, imbricated leaves, Bruch and Schimper distinguish their *Tetraplodon urceolatus* (*Splachnum urceolatum* Bridel partly, not of Hedwig) by its shorter, more imbricated, and concave leaves, with the nerve ceasing below the almost filiform apiculus; by the shorter and thicker fruitstalk; smaller and rounder apophysis; smaller peristome; and by the capsule, which is not constricted when dry.

298. 2. *Tetraplodon angustatus* Br. and Sch. (*narrow-leaved Collar-Moss*); stems tufted; leaves lax, erecto-patent, ovate-lanceolate, much acuminated, serrated; apophysis obconical, scarcely narrower than the capsule; fruitstalk short; teeth of the peristome in fours. (Tab. IX.)
T. angustatus *Bryol. Europ.* Monogr. p. 4. t. 1.
Splachnum angustatum *Lynn.* fil. Meth. Musc. *Hedw.* St. Cr. ii. t. 12. *Smith,* Eng. Bot. t. 1132. *Funck,*

Deutsch. Moose, t. 7. f. 3. *Schwaegr. Web. and Mohr. Swartz. Wahlenb. Hook. and Tayl. Bridel. Dill.* Musc. t. 85. f. 16.?

Hab. On dung and decayed animal substances, in alpine situations; rare. By Loch Awen, *Mr. Dickson.* Scottish mountains, *Mr. Mackay.* Cairngorm, and mountains of Braemar. In Glen Dole, growing with *T. mnioides, W. Wilson.* Fr. July, August.

Stems ½—2 inches long or more, in North American specimens much longer, densely tufted. Leaves with long tapering points, more or less distinctly serrated, concave, the nerve ceasing near the apex. Fruitstalk not much longer than the leaves, yellowish, pale. Capsule small, pale or yellowish-brown, of thick texture, constricted below the mouth when dry, the apophysis twice as long, obconical, somewhat wider than the fully ripe capsule, but in an early stage rather narrower, sprinkled, as in others of this family, with cuticular stomata. Lid conical. Teeth of the peristome 4 together, connate at the base, lanceolate-obtuse, reflexed when dry, reddish-brown.

Splachnum setaceum Michaux, according to the specimens published in Drummond's second edition of *North American Mosses* by Hooker and Wilson, differs from the above in the mitriform calyptra, very short, not exserted fruitstalks, and in the narrower, carinate leaves. (See also the remark of Bruch and Schimper in *Bryol. Europ.*, under *Splachnum ampullaceum.*)

68. TAYLORIA.

TAYLORIA *Hooker;* with part of SPLACHNUM and EREMODON, *Bridel, &c.*

RAINERA *De Notaris.*

Capsule on an elongated fruitstalk, erect or inclined, its long neck or apophysis clavate, or narrowly subpyriform, of thick texture. *Lid* conical, or conico-rostellate, of the same colour as the capsule. *Calyptra* conico-mitriform, erect, inflexed at the base, subsequently lacerated below, or split on one side. *Peristome* single, inserted below the mouth of the capsule; *teeth* 16 or 32, approximated and cohering in pairs (usually longer than in the genus *Dissodon*), incurved when moist, reflexed and sometimes twisted when dry, exceedingly hygrometric in one species. *Spores* yellowish or greenish, small.

Stems more or less cæspitose, with innovations from below the floral apex, tomentous with radicles.

Leaves more or less spreading, soft and succulent, semiamplexicaul, obovate-acuminate, or lanceolate, carinate, coarsely serrated at the apex; *areolæ* lax, diaphanous; *nerve* thin, ceasing near the apex.

Inflorescence monoicous. *Barren flowers* capituliform, sometimes at the base of the innovations, sometimes on a lateral branch; *antheridia* numerous, with subclavate paraphyses; *perigonial leaves* spreading in the upper part.

Perennial, growing on decayed animal or vegetable substances in alpine situations.

Intermediate between *Tetraplodon* and *Dissodon;* distinguished from the latter by the almost capituliform barren flower, and by the hygroscopic peristome inserted lower down within the mouth of the capsule; and from *Tetraplodon* by the form of the barren flower, by the structure of the calyptra, and by the neck of the capsule, which is scarcely to be considered as a true apophysis. The barren flowers are spreading, and differ only from *discoid* barren flowers in having the perigonial leaves very slightly different from those of the stem.

Three species of *Tayloria* are described in the *Bryologia Europœa.* Name in honour of the late Dr. Thomas Taylor, of the *Muscologia Britannica.*

299. *Tayloria serrata* Br. and Sch. (*serrated Collar-Moss*); leaves oblong-obovate, acuminate, coarsely serrated above, nerve ceasing below the apex; capsule shorter than the oblong neck, oval; lid conico-convex, obtuse; teeth of the peristome incurved when moist, reflexed when dry; spores very small, yellowish. (TAB. IX.)

T. serrata *Bryol. Europ.* Monog. p. 6. t. 1, 2.
Splachnum serratum *Hedw.* Sp. Musc. t. 8. *Schwaegr. Web. and Mohr. Bridel. Funck,* Deutsch. Moose, t. 7. f. 5.

var. β. flagellaris; branches slender, overtopping the fruit; capsule subcernuous.

Splachnum flagellare *Bridel,* Bryol. Univ.
Splachnum helveticum *Schleicher.*
Splachnum serratum *Schwaegr.* Suppl. i. 1. p. 49.

var. γ. tenuis; leaves broader and shorter; capsule smaller, on a more slender fruitstalk, much contracted when dry; columella exserted.

Splachnum tenue *Dickson,* Crypt. Fasc. 2. p. 2. t. 4. f. 2. *Smith,* Eng. Bot. t. 1133. *Hook. and Tayl.* tab. ix.
Splachnum attenuatum *Bridel,* Mant. Musc.
Splachnum lingulatum *Hoffm. Röhling.*
Splachnum serratum *Schwaegr.*
Grimmia splachnoides *Smith,* Fl. Brit. (not Eng. Bot.)

Hab. The var. γ. only is found in Britain. Scotch mountains, upon the ground in very elevated situations, on turfy soil. Ben Lawers. Head of Glen Callater. Fr. July, August.

Stem not an inch long, radiculose. Leaves in 8 rows, erecto-patent, recurved at the apex, erect when dry, lower ones ovate-lanceolate, acuminate; upper ones larger, subspathulate-acuminate, carinate, serrated above. Fruitstalk rather thick, reddish. Capsule mostly erect, oval, with a long, narrow, tapering neck or apophysis, yellowish-brown, at length reddish-brown or blackish. Columella exserted when dry only in the var. γ. Calyptra submitriform, inflexed at the base.

On the positive authority of Bruch and Schimper, who have carefully studied this species in its various forms while growing, we are assured that *Splachnum tenue*, notwithstanding the exserted columella of the dry capsule, is only a variety of *Tayloria serrata*, the two forms having been found growing in the same tuft.

Splachnum longicollum of Dickson (*Crypt. Fasc.* 4. t. 10. f. 9.) is said by Mr. Brown to have never been found in Britain: the specimens in the Banksian Herbarium were brought from the north-west coast of America by Sir Joseph Banks and Mr. Menzies, not from the Cape of Good Hope, as stated in Schwaegr. Suppl. ii. 2. 87. t. 178. The specimens in *Herb. Turner* from Dickson, ostensibly of Scottish growth, betray the strongest evidence of having grown in the same place as the confessedly foreign specimens in the same Herbarium from Dickson. Moreover, *S. longicollum* may prove to be only a variety of *Tayloria serrata*, though Schwaegrichen describes the peristome as having 16 equidistant teeth. The specimens before us are not in a fit state for examination. *S. longicolla* Swartz (in *Herb. Turner*), from Sweden, is a state of *S. ampullaceum*, with small apophysis, and long fruitstalk.

69. DISSODON *Grev. and Arn.*

WEISSIA (partly) *Hook. and Tayl., &c.*
EREMODON (partly) *Bridel.*
CYRTODON *R. Brown.*

Capsule on an elongated fruitstalk, erect or inclined, oval, with a long, solid, tapering neck. *Lid* conico-convex, obtuse. *Calyptra* conico-mitriform, inflexed at the base, laterally cloven. *Peristome* single; *teeth* 32, united into 8 bigeminate teeth, or into 16 pairs, linear-lanceolate, plane, transversely articulated, converging when moist, somewhat incurved when dry. *Spores* rather large. *Vaginula* thick and solid, conico-oblong. *Columella* exserted when dry by the shrinking of the capsule, dilated at the apex.

Stem dichotomous, with innovations either from below the floral apex or from the middle of the stem, tomentous with radicles.

Leaves in eight rows; *lower ones* remote; *upper ones* crowded, slightly spreading, loosely imbricated, oval-oblong or sublingulate, obtuse, entire, concave; *areolation* lax, oblong-hexagonal or rhomboid; *nerve* thin, ceasing below the apex.

Inflorescence either synoicous or monoicous; *flowers* subgemmiform; *antheridia* oval-oblong, with subclavate paraphyses; *archegonia* few, with slender styles, mixed with short filiform paraphyses.

Perennial, compactly cæspitose mosses, growing in moist alpine situations.

Distinguished from *Tayloria* thus: Leaves obtuse, entire, concave, and subimbricated; barren flowers gemmiform; peristome scarcely hygrometric, not reflexed when dry, inserted higher up in the mouth of the capsule; the habitat more strictly terrestrial, and not dependent on animal substances.

The peristome, apparently consisting of 8 pairs of teeth, is really composed of 8 double pairs, each tooth having two rows of cellules, each row representing one tooth of a peristome with 32 primary divisions. In one species the lid remains attached to the columella.

Three species are described in the *Bryologia Europæa.* Name from *διϭσος, double,* and *οδων, tooth.*

300. 1. *Dissodon Froelichianus* Grev. and Arn. (*Froelich's Collar-Moss*); stems cæspitose, or scattered; leaves ovate-oblong, obtuse, nerve ceasing below the apex; capsule (with the apophysis) clavato-pyriform; lid conical; teeth of the peristome in pairs. (TAB. IX.)

Dissodon Froelichianus *Greville and Arnott,* Tent. Meth. Musc. iii. p. 121. t. 13. n. 39—44.

Splachnum Froelichianum *Hedw.* St. Crypt. t. 40. *Schwaegr. Funck,* Deutsch. Moose, t. 7. f. 6. *Bridel,* Bryol. Univ. *Hook. and Tayl.*

Splachnum reticulatum *Dicks.* Crypt. Fasc. 2. t. 4. f. 6. (Bryum). *Swartz. Smith,* Eng. Bot. t. 2507. (fig. of leaf wrong, copied from a hasty sketch of W. J. H. in *Herb. Turner*).

Hab. On Ben High in Aberdeenshire, *Mr. Dickson.*
Fr. July, Aug.

The figures given in Dickson's work and in *English Botany* are so unlike Hedwig's moss, that it may be questioned whether they belong to the same species. The leaf in *Eng. Bot.* is erroneously figured as roundish-ovate and acute. In genuine examples of the Hedwigian species, and also in Dickson's specimen of *S. reticulatum* in *Herb. Turner*, it is oblong or ovate-oblong, obtuse or obsoletely acuminate, of thin cellular texture, shrinking much when dry, areolæ lax and diaphanous. Stem about half an inch in height. Capsule clavato-pyriform, tapering into the fruitstalk, yellowish or reddish-brown, much shorter and subglobose when dry. Fruitstalk thick, half an inch or an inch long, reddish. Lid conical, obtuse. Teeth of the peristome in 16 pairs, inserted a little below the mouth of the capsule, yellowish, narrowly lanceolate, marked longitudinally with a medial line, erect or subincurved when dry. Columella not exserted. Spores large, brownish, papillose. Calyptra submitriform, inflexed at the base. Inflorescence synoicous, or polygamous.

The reputed specimen of this moss from Mr. Dickson, in *Herb. Turner*, is not in a fit state for examination; but it appears to us to be only a small starved state of *D. splachnoides.* Hence *D. Froelichianus* must be considered a very doubtful native of Scotland, and is inserted here only in deference to previous writers on the subject.

301. 2. *Dissodon splachnoides* Grev. and Arn. (*marsh alpine Collar-Moss*); leaves erecto-patent, imbricated, lingulate, obtuse, nerve ceasing below the apex; capsule obovate, with a short neck tapering into the slender elongated fruitstalk; teeth of the peristome 16, equidistant, acuminate; spores small. (TAB. XIV.)

Dissodon splachnoides *Grev. and Arn.* l. c. t. 13. No. 39—44. *Br. and Sch.* Monogr. p. 10. t. 3.
Weissia splachnoides *Schwaegr.* Suppl. t. 17. *Bridel*, Meth. *Hook.* in Fl. Lond. (with a figure). *Greville*, Scot. Crypt. Fl. t. 145. *Funck*, Deutsch. Moose, t. 9. f. 1. *Hook. and Tayl.* tab. xiv.
Grimmia splachnoides *Smith*, Eng. Bot. t. 2164.?
Splachnum lingulatum *Dicks.* Crypt. Fasc. 4. t. 10. f. 6. *Smith*, Fl. Brit. (excl. syn. Swartzii). Eng. Bot. t. 2095. *Brid.* Meth.
Eremodon splachnoides *Bridel*, Bryol. Univ. *Nees and Hornsch.* Bryol. Germ. t. 39.
Cyrtodon splachnoides *Rob. Brown*, in Parry's 1st Voyage. *Hook.* in Eng. Fl.
Weissia turbinata *Drummond*, Musci Americ. No. 64.
Splachnum reticulatum *Dickson*, Crypt. Fasc. 2. t. 4. f. 6.?

Hab. Wet turfy bogs on the Scottish mountains. Abundant below the summit of Craig Challeach, Breadalbane.

Fr. August.

Growing in dense, extensive, blackish-green patches. Stems 1—4 inches or more in length, dichotomous, tomentous below with blackish radicles. Leaves suberect and crowded; lower ones lurid; upper ones oval-oblong or lingulate, concave, almost entire, the margin nearly plane, reticulated; the younger leaves pale green. Fruitstalk an inch long and more, slender, yellowish or reddish. Capsule usually erect, obovate, olive-brown, shortened when dry, so that the capitate columella becomes exserted. Lid conical when dry, slightly apiculate. Teeth of the peristome yellowish, erect and somewhat incurved when dry. Spores three times smaller than in the preceding species, granular, greenish. Calyptra submitriform, inflexed at the base, whitish. Inflorescence as in *D. Froelichianus*.

70. ŒDIPODIUM *Schwaegr.*

GYMNOSTOMUM (partly) *Hook. and Tayl.*
SPLACHNUM *P. Beauv.*

Capsule (with the apophysis) clavato-pyriform; the *apophysis* very long, and insensibly passing into the thick succulent fruitstalk. *Peristome* none. *Sporangium* nearly globular, contiguous to the walls of the capsule. *Columella* somewhat dilated at the apex. *Calyptra* narrow, succulent, laterally cloven, fugacious. *Lid* plano-convex, or conical. *Spores* of moderate size, reddish. *Vaginula* oblong.

Stems loosely cæspitose or gregarious, simple, or with innovations from below the floral apex; *branches* fastigiate.

Leaves in five rows, the *upper ones* collected into a spreading tuft, roundish-obovate, narrow at the base, semiamplexicaul, tender and succulent, entire above, ciliated towards the base; *areolæ* rather large, roundish-hexagonal, larger towards the base of the leaf; *nerve* ceasing near the apex.

Inflorescence synoicous or monoicous; *antheridia* rather large, oblong, with subclavate paraphyses; *archegonia* with short styles, mixed with filiform paraphyses.

Perennial, growing in the crevices of alpine rocks.

Only one species is known of this singular genus. In habit it is allied to *Dissodon*, and its whole texture is remarkably succulent. The fruitstalk may be considered as almost entirely belonging to the apophysis, being hollow nearly to the base, and gradually tapering to the very narrow vaginula. In the unripe capsule the top of the columella is continuous with the top of the sporangium, as in *Hymenostomum*, *Tetrodontium*, &c., the junction being nearly opposite to the line of dehiscence of the lid, which is itself filled with very lax cellular tissue apparently continuous with the sporangium. The unripe spores are clustered four together, and do not appear to be ranged in radiating lines as in the true *Splachna;* but we have not examined recent specimens since this feature of the *Splachneæ* was first noticed. (See Mr. Valentine's Essay in *Lin. Trans.* vol. 18. p. 499.)

The genus is named from *οιδος*, *πους*, in allusion to the swollen fruitstalk.

302. *Œdipodium Griffithianum* Schwaegr. (*Griffith's alpine Collar-Moss*). (Tab. VII.)

Œdipodium Griffithianum *Schwaegr.* Suppl. t. 105. *Bridel. Br. and Sch.* Monogr. p. 4. t. 1.
Gymnostomum Griffithianum *Smith*, Eng. Bot. t. 1938. *Hook. and Tayl.*
Bryum Griffithianum *Dickson*, Crypt. Fasc. 4. t. 10. f. 10.
Splachnum Froelichianum *Withering* and *Hull* (according to *Smith*).

Hab. In the crevices of rocks, upon elevated mountains in England, Wales, and Scotland; not known to grow in any other country. Fr. July, August.

Growing in lax, glaucous-green tufts. Stems about one-fourth of an inch or more; when barren and gemmiferous, 1 or 2 inches in length; succulent, and fragile. Leaves large, roundish-obovate, very obtuse, succulent, and brittle, entire at the apex, the lower part fringed with long-jointed filaments, concave below, flattish above, spreading, slightly crisped when dry, the nerve disappearing below the summit. Fruitstalk about half an inch long, gradually thickened upwards, and passing into the apophysis, succulent, pale green, fragile. Capsule (with the apophysis) clavate-pyriform, orange-red when first ripe. Sporangium subglobose. Spores reddish, rather large. Lid convex, obtuse. Annulus none. Calyptra diaphanous below, brownish above, dimidiate. Gemmæ are found in the axillæ of the upper leaves of the tall barren plants; they are obovate, compressed, with lenticular edges, and are sometimes intermixed with abortive archegonia and antheridia.

FILICOIDEI *Bridel.*

The members of this group are remarkable for the vertical position of the plane of the two-ranked leaves. The fructification of some is terminal; of others lateral or radical. They seem to occupy an intermediate place between *Acrocarpi* and *Pleurocarpi.*

SUBORDER XXVII. SCHISTOSTEGEÆ.

71. SCHISTOSTEGA *Mohr.* Cavern-Moss.

Stems annual, from a perennial conferva-like thallus, without innovations, very tender, dimorphous: *fertile stems* either frond-shaped, or leafy only at the summit, which has a rosaceous tuft of narrow leaves; *barren stems* longer, frond-shaped; all the stems simple, or very rarely branched at the summit, naked below, rooting only at the base, densely crowded. *Leaves* vertically inserted and bifarious, plane, oval-rhomboid, acute, confluent at their bases; *terminal leaves,* on the fertile and barren-flowered stems, horizontally inserted; smaller, lanceolate (disp. $\frac{3}{8}$), all of them with large rhomboid areolæ, very tender, nerveless, entire.

Inflorescence dioicous, terminal. *Barren flower* lax, gemmiform; *anthers* 2—4, subsessile. *Fertile flowers* like the barren, but with longer leaves; *archegonia* mostly solitary, with one or two distant paraphyses. *Capsule* small, oval, when old subglobose, on an elongated tender pellucid pedicel, whose swollen base is fixed within the leafy vaginula. *Peristome* none. *Lid* convex. *Annulus* imperfect. *Calyptra* cylindrico-conical when young, at length dimidiate, very small, fugacious. *Sporangium* entirely filling the capsule. *Columella* thick, not exserted. *Spores* minute, at first disposed in radii around the columella, as in *Splachnum.*

The only genus of this beautiful and singular family; consisting of a single species, standing apart from other genera with terminal fructification, and approaching the *Rhizogoneæ.* Its favourite locality is the roof and sides of caves, in sandstone rocks of a certain equable degree of humidity and gloom.

The name, from σχιστος, *split,* and στεγη, *lid,* retained only from an unwillingness to multiply synonyms, is not strictly applicable, having reference to the lid, which was supposed to be spontaneously fissile into numerous segments from the circumference to the centre. Ehrhart dedicated it as a genus to Mr. Dickson.

303. *Schistostega osmundacea* (*Cavern-Moss*). (Tab. VIII.)
S. osmundacea *Web. and Mohr,* Tasch. p. 92. *Nees and Hornsch.* Bryol. Germ. t. 11. f. 1. *Bridel,* Bryol. Univ. *Br. and Sch.* Bryol. Europ. fasc. 17.
Gymnostomum osmundaceum *Smith,* Fl. Brit. Eng. Bot. t. 2213.
Schistostega pennata *Hook. and Tayl.* Musc. Brit. ed. 1 and 2. tab. viii.
Gymnostomum pennatum *Hedw.* St. Crypt. t. 29.
Mnium osmundaceum *Dickson,* Cr. Fasc. 1. t. 1. f. 4. p. 3. (fig. and description good).
Dicksonia pusilla *Ehrhart,* Crypt. 65.
Bryum pennatum *With. Hull.*

Hab. Moist banks in several parts of Devonshire. Sandstone caves near Nottingham. Cheshire, Lancashire, Staffordshire, Derbyshire. First found by *Mr. Newberry,* on the road from Zele to S. Taunton Church, near Okehampton.
Fr. March.

Stems reddish, scarcely ½ inch long, very slender. Leaves pale glaucous-green, with lax reticulation, resisting moisture after having been dried. Capsule very small, erect, at first pale yellowish-brown, when old reddish-brown, wide-mouthed, roundish. Vaginula leafy in the lower half, as in pleurocarpous mosses. Seta pale and succulent, thick in proportion to the capsule. Lid slightly convex, not fissile. Calyptra usually dimidiate; sometimes mitriform, and vertical on the apex of the lid, very fugacious. Spores yellowish-green.

In this elegant moss, it is interesting to observe the transition, from a vertical insertion and bifarious arrangement of the leaves, to the ordinary horizontal insertion and octofarious arrangement. The lowest leaves are reduced to jointed, filiform processes. In the first stage of growth, this moss has been mistaken for a conferva (*Catoptridium* Bridel, *Bryol. Univ.*), which, from its refractive property, illumines the dark recesses in which it loves to grow with a brilliant "golden-green light." (See *Mag. Nat. Hist.* vol. 3. p. 462.) When fully developed, the stems are densely crowded, falling away after the first year, and are then replaced by a fresh crop.

SUBORDER XXVIII. FISSIDENTEÆ.

72. FISSIDENS *Hedw.* Flat Fork-Moss.

DICRANUM (partly) *Hook. and Tayl., &c.*

Stems cæspitose, frond-like, compressed, suberect or decumbent, simple, or branched, with one or two axes of vegetation, perennial, growing on the ground, or on rocks, rarely on the bark of trees.

Leaves semiamplexicaul, distichous, equitant, the upper part expanded into a vertical scalpelliform lamina, complanate, alternately inserted on opposite sides of the stem or rachis, entire or denticulate, with or without a cartilaginous thickened border, the nerve reaching nearly or quite to the apex (nerveless in two or three exotic species); *areolæ* roundish-hexagonal, opaque, filled with chlorophyll.

Inflorescence monoicous, or dioicous, terminal on the primary stem, or on very short lateral ramuli; *antheridia* and *archegonia* few, without paraphyses.

Capsule on a rather long pedicel, often cernuous, sometimes erect, oval, or oblong, more or less truncate, of thick firm texture, reddish-brown. *Calyptra* cucullate, or rarely conico-mitriform, somewhat longer than the lid. *Lid* conico-acuminate, or rostellate. *Annulus* obscure, often persistent. *Peristome* single; *teeth* 16, equidistant, long and tapering from a lanceolate base, cloven half-way or more into two unequal segments, geniculate and strongly inflexed when dry, transversely barred, deep red, hygroscopic. *Spores* rather small, nearly smooth, olive-brown.

The genera *Fissidens* and *Octodiceras* of Bridel form a very natural group (arranged by Bridel with *Drepanophyllum* and *Phyllogonium* in the class *Entophyllocarpi*), standing apart from other mosses, and distinguished by the peculiar structure and disposition of the leaves, the principal portion of which consists of a vertical lamelliform appendage formed by a dorsal expansion of tissue from the nerve and a prolongation of one of the wings of the true leaf. The lower leaves are almost destitute of this appendage.

This genus presents two modes of fructification. In some species the capsule is terminal (*acrocarpous*), in others it is lateral (*cladocarpous*), arising from a short fertile ramulus. The distinct vaginula removes it from pleurocarpous mosses. The peristome differs from that of *Dicranum* in the sudden geniculate inflexion of the teeth near the middle, and in being more hygroscopic. Name from the Latin, fissus, *split*, and dens, *tooth.*

Six European species are described in the *Bryologia Europæa.*

SECT. I. *Fruit terminal.*

a. Inflorescence monoicous.

304. 1. *Fissidens exilis* Hedw. (*slender Flat Fork-Moss*); stem very short, simple, suberect; leaves obliquely lanceolate, denticulate, not bordered, the dorsal wing discontinued above the base; fruitstalk terminal; capsule erect; lid as long as the capsule, obliquely rostellate; annulus dehiscent. (TAB. LIII.)

Fissidens exilis *Hedw.* Sp. Musc. 152. t. 38. (fig. not good). *Schwaegrichen* (partly). *Bridel* (partly).
Bryum paucifolium *Withering.* Arrangem. v. 3. p. 798.
Bryum viridulum *Dickson,* Crypt. Fasc. 1. p. 3. t. 1. f. 5.
Dicranum viridulum *Smith,* Eng. Bot. t. 1368. (as to the figure only, not the description), not of *Swartz,* Musc. Suec.
Dicranum bryoides *β.* minus *Turner,* Musc. Hib.
Hypnum minutum *Linn. MSS.* in Herb. Linn.
H. trifoliatum *Donn, MSS.* in Herb. Turner.
Fissidens Bloxami *Wilson,* in Lond. Journ. Bot. 1845, p. 195. t. 9.

Hab. On shady banks, in woods, &c. Endfield Chase, *Mr. Dickson.* Near Forfar, *G. Donn.* Ireland, *Dr. Scott.* Budds Clough, Cheshire, and near Warrington, 1834, *W. Wilson.* Orton Wood, Leicestershire, 1844, *Rev. A. Bloxam.* Hurst Pierpoint, Sussex, growing with *F. incurvus,* in the original station for *Dicranum viridulum* of Eng. Botany, *Mr. W. Mitten.* Yorkshire, *Mr. Spruce.* Murrayshire, *Mr. A. Croall.* Fr. Jan. Feb.

One of the smallest species of the genus. Stems scarcely 1 line in height, inclined. Leaves 2-ranked, as in all the other species, very few, seldom more than 6, sometimes only 4, moderately spreading, the lower ones smaller than the rest, ovate, scattered; upper leaves obliquely lanceolate-oblong, acute or apiculate, denticulate, especially on the margin of the wings of the true leaf (or sheathing conduplicate portion), which equals in length the vertical lamina; the outline of the whole, in consequence of the cessation of the dorsal wing above the base of the leaf, and of the dilatation of the vertical lamina, singularly crooked or oblique; nerve strong, percurrent, or ceasing very near the apex; areolæ rather large, dot-like; colour deep-green. When dry the leaves are not at all crisped nor glossy. Fruitstalk 2—4 lines long, slender, somewhat flexuose, pale or reddish, geniculate at the base. Capsule erect, elliptic-oblong, constricted below the mouth when dry, olive-brown. Lid as long as the capsule, or longer, conico-rostellate, or rostrate, composed of 32 vertical rows of cellules (64 in all the allied species), pellucid. Annulus distinct, pale, spirally unrolling. Teeth of the peristome red, split into two unequal segments. Calyptra conical, laterally cloven, brownish, as long as the lid. Spores small, olive. Barren flower gemmiform, at the base of the fertile stem.

Distinguished from allied British species by the denticulate leaves, destitute of border, and from *F. Hornschuchii* of Montagne by its smaller size; differently shaped leaves, with larger areolæ; and by the distinct annulus.

In the description of *Dicranum viridulum* in *Eng. Bot.*, it is stated that the specimens from Hurst Pierpoint agree with those in the Linnæan Herbarium, and have the leaves "undulated or crisped by drying." This character is sufficiently obvious in the next species, but entirely absent in this. Both of them are found in the Linnæan Herbarium, named *Bryum viridulum.* Dr. Hedwig's remark (in *Sp. Musc.* p. 152.), "folia minime crispabilia ad siccitatem," which Smith pronounces to be "altogether erroneous and unwarrantable," correctly applies to this species, specimens of which were given by Dickson to Hedwig and to Smith, corresponding with others in Mr. Turner's Herbarium. Those given by Dickson to Mr. Borrer belong, however, to the next species; and relying too much on them, the present moss was described, as new, under the name of *F. Bloxami.* Even Swartz has repeatedly given this moss as *Dicranum viridulum;* but his figure and description in *Musc. Suec.* belong to the next species.

05. 2. *Fissidens viridulus* Linn. (*green Flat Fork-Moss*); stem simple, inclined; leaves lanceolate, bordered, entire, the dorsal wing discontinued above the base, nerve subcontinuous; capsule erect or inclined, oval-oblong; lid conical, acuminate; barren flower terminal. (Tab. LIII. *a.*)

Bryum viridulum *Linn.* in Herb. Linn.! (partly).
Dicranum viridulum *Swartz,* Musc. Suec. p. 84. t. 2. f. 3.
Fissidens viridulus *Wahlenb.* Fl. Lapp.
F. incurvus *Bruch and Schimper,* Monogr. p. 6. t. 1. (not *Schwaegr.*)
F. exilis *Funck,* Deutsch. Moose, t. 22. n. 1. (not *Hedwig*).

var. β. pusillus; stem shorter; leaves erect, narrow, acute; capsule suberect; peristome immersed.

F. pusillus *Wills. MSS.*

var. γ. major; stem elongated; leaves larger, more numerous; fruitstalk thicker. (Tab. LIII. *γ.*)

F. crassipes *Wils. MSS.*

var. δ. fontanus; stem elongated, branched; leaves with a wider border, obtusely toothed; capsule smaller; fruitstalk shorter.

F. incurvus var. fontanus *Br. and Sch.* l. c.

var. ε. incurvus; leaves spreading, lanceolate-oblong, apiculate; capsule cernuous, curved; peristome not immersed; barren flower gemmiform, at the base of the stem. (Tab. LIII. *ε.*)

F. incurvus *Schwaegr.* Suppl. t. 49. *Funck,* Deutsch. Moose, t. 22. n. 2. *Bruch and Schimper,* Bryol. Europ. (partly).
Dicranum incurvum *Web. and Mohr,* Bot. Tasch. 465.
Fissidens tamarindifolius *Bridel,* Br. Univ. (partly).
F. gracilis *Bridel* (fide *C. Müller,* Syn. Musc.).

Dicranum viridulum *Smith,* Fl. Brit. and Eng. Bot. t. 1368., *as to the description only* (not of *Swartz*).

D. bryoides var. *Hook. and Tayl.* tab. xvi. *middle figure.*

var. ζ. Lylei; leaves almost destitute of border; in other respects as in var. β.

F. Lylei *Wils. MSS.*

Hab. On shady banks, sandstone rocks, stones in rivulets, &c.; var. γ. in sluices. Near York, *Mr. Backhouse.* Near Warrington. Near Airth, Scotland, *Mr. T. Lyle.* Var. δ. not found in Britain. Var. ε. on banks, and in pastures, but not frequent. Hurst Pierpoint, Sussex, with *F. exilis, Mr. Mitten.* In the cricket ground of the collegiate school, York, *Mr. Spruce.* By the wall of Orford Park, near Warrington. Fr. Aug. Sept.; var. ε. in February and March.

Stems inclined or decumbent, gregarious; in the typical form not above ¼ inch long; in the var. γ. twice or thrice as long; shorter in the var. β. Leaves more numerous than in the preceding, 8—10, more or less crowded, often bending towards the back of the frond, crisped when dry, pale green, and somewhat glossy, lanceolate, more or less acute, the dorsal wing ceasing above the base; nerve ceasing at or near the apex, narrower than in the preceding; areolæ smaller. Fruitstalk pale or reddish. Capsule rather small, mostly erect and symmetrical, occasionally oblique in all the varieties; cernuous and curved in the var. ε., oval-truncate, or oblong. Annulus obscure, pale, narrow. Lid about half as long as the capsule. Calyptra whitish, dimidiate, as long as the lid. Peristome inserted below the mouth of the capsule. Barren flower terminal on a short leafy shoot; gemmiform and sessile at the base of the stem in var. ε.

Swartz's specimen of *Dicranum viridulum* in *Herb. Smith,* corresponding with the one intended by Linnæus in *Herb. Linn.,* has the leaves more spreading and obtuse than they appear to be in native specimens, but the difference seems to be not essential. Swartz confounded this with the preceding species, and sent it to Dr. Arnott, named *Dicranum bryoides.*

The var. ε. *incurvus,* having a constantly cernuous and curved capsule, which ripens at a different season; sessile, gemmiform, barren flowers; and spreading, elongated, apiculate leaves; may perhaps be a distinct species. The stems are less than ¼ inch long. Fruitstalk red, slender. Peristome not immersed below the mouth of the capsule.

Dicranum palmatum of Swartz is nearly allied to *F. incurvus,* but has flaccid, subspathulate leaves, almost destitute of border; the nerve very narrow; and the lid rostrate. Some of Swartz's specimens, however, sent under this name, belong to another species.

306. 3. *Fissidens bryoides* Hedw. (*common Flat Fork-Moss*); leaves spreading, widely lanceolate, apiculate, with a thick cartilaginous border, the dorsal wing broad at the base, nerve subexcurrent; capsule elliptical, erect; lid conical-acuminate; barren flowers axillary. (Tab. XVI.)

Fissidens bryoides *Hedw.* St. Crypt. iii. t. 29. (except

fig. 10.) *Röhling. Roth. Bridel. Funck,* Deutsch. Moose, t. 22. f. 3. *Br. and Sch.* Monogr. p. 8. t. 2.
Dicranum bryoides *Smith,* Eng. Bot. t. 625. *Turner. Hook. and Tayl.* (partly).
Fissidens exilis *Schwaegr.* (partly).

Hab. Shady banks, &c. Fr. Jan., Feb.

Stems from 2 lines to ½ inch long, or more, suberect. Leaves rather distant, with distinct cartilaginous border, crisped when dry, the dorsal lamina, at the base of the leaf where it joins the stem, always of considerable breadth, not narrowed off as in the preceding species; nerve strong, pellucid, subexcurrent; areolæ small; colour full green, somewhat shining. Fruitstalk red. Capsule erect and symmetrical, more elliptical than in *F. viridulus,* not truncate. Lid longer, and more acutely rostellate. Peristome red. Annulus rudimentary, persistent. Calyptra dimidiate. Barren flowers numerous, axillary, gemmiform, never terminal.

Easily distinguished from the preceding by the axillary barren flowers, and by the broader dorsal wing of the leaf. Swartz appears to have been unacquainted with this species.

b. Inflorescence dioicous.

707. 4. *Fissidens osmundoides* Hedw. (*alpine Flat Fork-Moss*); stems densely tufted, radiculose below; leaves crowded, ovate-lanceolate, not bordered, nerve ceasing below the apex; capsule suberect, small, oval-oblong; lid rostrate; calyptra submitriform. (Tab. XVI.)

Fissidens osmundoides *Hedw.* Sp. Musc. t. 40. *Schwaegr. Funck,* Deutsch. Moose, t. 22. n. 4. *Bridel. Br. and Sch.* Monogr. p. 8. t. 3.
Dicranum osmundioides *Swartz,* Act. Holm. 1795. p. 240. *Turner. Smith,* Eng. Bot. t. 1662. *Web. and Mohr.*
D. bryoides *Swartz,* Musc. Suec. p. 86. t. 2. f. 4.
Fissidens bryoides *Wahlenberg.*
Dicranum bryoides var. *β.* elongatum *Hook. and Tayl.* tab. xvi. *right-hand figure.*
Hypnum asplenioides *Dickson,* Crypt. Fasc. 2. p. 10. t. 5. f. 5. (omitting the synonym of *Swartz*).

var. β. microcarpus; leaves shorter, incurved; fruitstalk very short; capsule small. *Br. and Sch.* l. c.
Fissidens acacioides *Linn. Bridel,* Br. Un. ii. 705. *Dill.* Musc. t. 34. f. 4.

Hab. On wet rocks, on the mountains of Wales, Scotland, Ireland, and the North of England; sometimes in bogs. Near Todmorden, *Mr. John Nowell.* Fr. Oct., Nov.

Stems 1—2 inches long, branched, erect, densely tufted, cohering by means of radicles; branches erect. Lower leaves distant, small; upper ones larger, crowded, ovate-lanceolate or oblong-lanceolate, rather obtuse, apiculate, of firm texture, incurved when dry, very minutely crenulate, or almost entire, the dorsal wing ceasing abruptly just above the base of the leaf; nerve strong, ceasing near the apex, which is sometimes toothed; areolæ round, dot-like, larger than in *F. bryoides.* Fruitstalk about ⅓ of an inch long, reddish, rather thick. Capsule oval-oblong, suberect or inclined, reddish-brown. Lid as long as the capsule, or longer, convex below, with a long, slender beak. Calyptra conico-subulate, inflexed at the base, where it is torn into several lobes, rather longer than the lid, whitish. Barren-flowered plant more slender than the fertile one, its flower terminal.

From *F. bryoides* this species is abundantly distinct in the leaves, which are destitute of border; in the long, rostrate lid; the calyptra; and the dioicous inflorescence: its habit is also very different. A variety with secund leaves is found in Ireland.

The var. β., found near Bex and Geneva in Switzerland, so closely resembles the Dillenian figure above cited, that we cannot doubt the identity of the original specimen, which Bridel believed to be different, and which he supposed to have been replaced in the Herbarium of Dillenius by a specimen of *F. osmundoides.* The Swiss specimens in Schleicher's Herbarium appear to have grown either in water, or in very wet situations; the capsules are so small as to be inconspicuous; and the fruitstalk is barely 1½ line in length. We have specimens in an intermediate state from a bog near Malham, Yorkshire.

308. 5. *Fissidens asplenioides* Swartz, Hedw. (*fern-like Flat Fork-Moss*); dioicous; stem linear, elongated, simple or branched; leaves numerous, linear-lanceolate, or ligulate, entire, rather obtuse, incurved when dry; fruitstalk terminal, rather short; capsule suberect, obovate, slightly incurved; lid rostrate, as long as the capsule; barren flowers axillary, or terminal. (TAB. LIII.)

Dicranum asplenioides *Swartz*, Fl. Ind. Occid. iii. p. 1770.
Fissidens asplenioides *Hedw.* Musc. Frond. 3. t. 28. *Schw.* not *Dickson.*

var. β. polyphyllus; stems longer; branches arcuate; leaves wider, rather acute, more strongly nerved, serrulate at the apex; barren flowers numerous, axillary. (TAB. LIII.)

F. polyphyllus *Wils. MSS. Bruch and Schimper*, Brycl. Eur. Suppl. t. 3.

var. γ. serrulatus; leaves twice as large, wider, apiculate, distinctly serrated at the apex.

Fissidens serrulatus *Bridel.* Br. Un. ii. 704. *Montagne*, in Ann. Sc. Nat. & Hist. Nat. des Isles Canaries par *Webb and Berthelot* (1840), p. 22, 23. t. 2. f. 1.
F. divisus *Kunth.*

Hab. Var. β. on moist shady rocks in mountainous situations. Near Glengariff, Ireland, Nov. 1829. Plentiful on rocks near Pont Aberglaslyn, 2 miles from Beddgelert, on the right of the road to Tremadoc, N. Wales, 1838, *W. Wilson.* Fr.?

The var. β., unaccountably referred to *F. adiantoides* by C. Müller (*Syn. Musc.*), has been found with barren flowers only, and therefore cannot be certainly determined. In the size, shape, and structure of the leaves, it is quite intermediate between *F. asplenioides* and *F. serrulatus;* and after attentive examination of authentic specimens, we are led to unite these three, as varieties of one species. Bridel was not aware of the affinity of *F. serrulatus*, not having seen the fruit, and compares it with *F. adiantoides*, from which it is sufficiently distinct. The fruit of *F. serrulatus* agrees quite with that of *asplenioides*, and the barren flowers are axillary, according to Dr. Montagne, as in our var. *β.*, to which we confine our description.

The stems of our var. *β. polyphyllus* are from three inches to a foot and more in length, often curved, rigid and elastic, branched. Leaves nearly twice as long as in *F. adiantoides*, and of firmer texture, glossy, incurved, not crisped when dry, oblong-lanceolate or almost ligulate, subacute, entire; except at the apex, which is denticulate; dorsal wing rounded at the base, ceasing a little above the base of the leaf; nerve much thicker than in the preceding, sharply and distinctly channelled on the upper side, as seen in a section of the lower part of the leaf; areolæ dot-like; colour of the foliage varying from pale green to light yellowish-brown, according to age. Barren flowers plentiful in the axillæ of the leaves, gemmiform, ovate, containing several oblong antheridia, with filiform paraphyses. *F. grandifrons* Bridel (*Bryol. Europ.* Monogr. p. 11. t. 8.) differs from *F. polyphyllus* in the narrower, tapering, fleshy, and very rigid leaves; their dorsal wing discontinued above the base: they agree in the structure of the nerve, and in the short vertical lamina; the conduplicate portion of the leaf occupying nearly two-thirds of the entire length.

F. polypodioides Sw., Hedw., differs from *F. asplenioides* in the truly axillary fruitstalks: the leaves also are more obtuse, and always entire at the apex: in other respects they are very closely allied, having foliage of the same firm texture, smooth and glossy when dry: they are among the largest and most beautiful of the genus.

Cultivated specimens of our var. *β.* approach still more nearly to *F. asplenioides* than those gathered wild; and we can by no means venture to separate it as a species. A figure of *F. asplenioides*, from an original specimen of Dr. Swartz, in fruit, is added to TAB. LIII. *f.* 3., magnified leaf.

SECT. II. *Fruit lateral.*

Inflorescence monoicous.

9. 6. *Fissidens adiantoides* Hedw. (*marsh Flat Fork-Moss*); monoicous; stem elongated, branched; leaves crowded, ovate-lanceolate, denticulate at the apex, minutely serrulate below, nerved to the apex; fruitstalks lateral; capsule cernuous, oval-oblong; lid rostrate. (TAB. XVI.)

Fissidens adiantoides *Hedw.* St. Crypt. iii. t. 26. *Schwaegr. Bridel. Funck*, Deutsch. Moose, t. 22. f. 6.

Dicranum adiantoides *Swartz. Turner. Smith. Web. and Mohr. Hook. and Tayl.*

Hypnum adiantoides *Linn.* Eng. Bot. t. 264. *Dill.* Musc. t. 34. f. 3.

Hab. Shady banks, wet pastures and bogs, and on wet rocks near waterfalls. Fr. Oct., Dec.

Stems 1—2 inches or more in length; in dry situations shorter, and more densely tufted, with paler-green leaves; in wet situations more loosely cæspitose, with dark-green leaves, branched; branches subfasciculate. Leaves crisped and incurved when dry, everywhere minutely serrulate, more evidently toothed at the apex, with or without a pale not thickened border, the dorsal wing broad and continued to the base; nerve brownish, reaching nearly or quite to the apex. Fruitstalks from the middle of the stem, ½—1 inch in length. Capsule more or less inclined, of thick texture; constricted below the mouth, and somewhat turbinate when dry. Lid with a long beak. Calyptra cucullate, longer than the lid. Barren flowers axillary, gemmiform, sometimes clustered.

The smaller form of this species somewhat resembles the next species; but is distinguished by the position of the fruitstalks: it is Bridel's var. β. *marginatus*, growing in drier situations than the typical form, having its leaves more evidently pale-margined. A variety of this species, with very short fruitstalks and erect capsules, was found in Yorkshire by the Rev. J. Dalton (*Herb. Turner*).

310. 7. *Fissidens taxifolius* Hedw. (*yew-leaved Flat Fork-Moss*); monoicous; stems branched and fasciculate from the base; leaves crowded, lanceolate, minutely crenulate; fruit from the base of the stem; capsule cernuous; lid with a long beak. (Tab. XVI.)

Fissidens taxifolius *Hedw.* Sp. Musc. t. 39. *Schwaegr. Brid.* Meth. *Br. and Sch.* Monogr. p. 9. t. 4.
Dicranum taxifolium *Swartz. Turner. Smith. Web. and Mohr. Hook. and Tayl.*
Hypnum taxifolium *Linn.* Sp. Pl. p. 1587. *Eng. Bot.* t. 426. *Dill.* Musc. t. 34. f. 2.

Hab. Moist shady banks, chiefly in a clayey soil. Fr. Dec.

The stems of this species are about ½ inch long, clustered several together from a common rooting base, where the barren and fertile flowers originate, as in the Bridelian genus *Rhizogonium*. Leaves mostly complanate, sometimes bending slightly to one side, when dry very little crisped or twisted, lanceolate, apiculate, not bordered, very minutely crenulate, light-green, the pellucid nerve extending almost to the apex, dorsal wing broad to the base, not decurrent. Fruitstalk about ½ inch long or more, flexuose, curved at the top. Capsule oblong or obovate, inclined or horizontal, of thick texture, constricted below the mouth when dry, reddish-brown. Lid convex at the base, rostrate, nearly as long as the capsule. Calyptra dimidiate, rather longer than the lid, whitish. Vaginula oblong, distinct, not insensibly passing into the perichætial ramulus, as in truly pleurocarpous mosses. Barren flower gemmiform, at the base of the fertile stem.

Notwithstanding the almost radical fructification, this species must be considered as *cladocarpous*.

311- 8. *Fissidens tamarindifolius* Donn, Turner (*short-leaved Flat Fork-Moss*); monoicous; stems fasciculate; leaves short, distant, spreading, narrowly elliptical, subfalciform, apiculate, bordered, entire, crisped or undulated when dry; fructification from the base of the barren shoots; capsule cernuous, curved; lid conico-acuminate; barren flower gemmiform, at the base of the stem. (TAB. LIII.)

Hypnum tamarindifolium *G. Donn*, in lit., according to *Smith*, Fl. Brit.

Dicranum tamarindifolium *Turner*, Musc. Hib. p. 55. *Smith*, Fl. Brit. 1231. *Web. and Mohr*, Bot. Tasch. p. 480.

Fissidens tamarindifolius *Bridel* (partly).

Fissidens incurvus var. *and* F. trichomanoides *Wilson*, *MSS.*

Hab. On banks, and in fallow ground. Ireland: Cullen's Wood, near Dublin, *Dr. Stokes.* Near Over, Cheshire, and in several places near Warrington, sparingly, *W. Wilson.* Near Bantry, *Miss Hutchins.* Scotland, *Mr. T. Lyle.* Hurst Pierpoint, *Mr. Mitten.* Fr. Feb., March.

Perennial. Stems or barren fronds about ½ inch long, suberect, more or less fasciculate, as in the preceding species. Leaves more distant than in *F. bryoides*, widely spreading, undulated or crisped when dry, 2-ranked, as in all the species of this genus; shorter and wider than those of *F. incurvus*, and of firmer texture; almost elliptical, subfalciform, apiculate, the border cartilaginous, pellucid, entire; nerve ceasing at or near the apex; colour light-green, or occasionally orange-brown. Fructification sometimes truly axillary, but often almost or quite radical, as in the preceding species; fertile branches variable in length, sometimes very short, sometimes nearly ½ inch long, with 12—20 leaves; perichætial leaves longer than the rest. Fruitstalk about ⅓ inch long, red, stouter than that of *F. incurvus.* Capsule decidedly cernuous and curved, ovate-oblong, roundish in dwarf specimens, reddish-brown. Teeth of the peristome paler than in *F. incurvus*, trabeculate on the inner side, and less strongly inflexed. Lid conico-acuminate, shorter than the capsule. Annulus very small. Barren flower at the base of the fertile stem, gemmiform.

This species appears to be essentially distinguished from *F. viridulus* of Swartz, and from *F. incurvus* of Schwaegrichen, by the presence of barren fronds, and by the fasciculate habit, as well as by the axillary cladocarpous fructification. It is twice as large as *F. incurvus*, of more robust habit, and is easily recognised by the short, apiculate, distant, and subfalciform leaves.

There is much uncertainty about the species originally intended to bear the name of *Dicranum tamarindifolium;* nor can we be absolutely sure that ours is the one published in *Turn. Musc. Hib.*, because the specimen from Dr. Stokes in *Herb. Turner* is only a solitary scrap, or rather a dwarf fertile ramulus, not 2 lines in length; but we find some equally small amongst specimens received from Mr. Mitten, having (like that) a roundish capsule. The cladocarpous fructification appears to be obscurely alluded to in *Smith, Fl. Brit.*; and it is therefore quite credible that Mr. G. Donn's specimen, which we have not seen, gathered on the banks of the lake of Forfar, and described in *Fl. Brit.*, belongs to the species now under consideration; but the specimen from Donn in *Herb. Turn.*, called *tamarindifolium*, certainly belongs to *F. exilis* Hedw. (*F. Bloxami* Wils.), and tends to show that two species have been confounded by Donn. Web. and Mohr affirm that *F. tamarindifolius* of Turner, and their *F. incurvus*, are the very same; but this appears to be a mistake. We have not seen any authentic specimen from those authors; but their description is sufficiently apposite to *F. incurvus* of Schwaegrichen.

SECTION II. PLEUROCARPI.

Fructification truly lateral; the fertile flower making its first appearance as an axillary bud, subsequently enlarged, but not much elongated, and rooting at the base; the vaginula which surrounds the base of the fruitstalk more or less blended with the original receptacle, and partially immersed below the point of insertion of the uppermost perichætial leaves.

SUBORDER XXIX. ANŒCTANGIEÆ.

73. ANŒCTANGIUM *Br. and Sch.*

ANŒCTANGIUM and HEDWIGIA *Schwaegr.* *Hook.*
GYMNOSTOMUM (partly) *Hook. and Tayl.*
ZYGODON *C. Müller*, Syn. Musc.

A genus of mosses with truly pleurocarpous fructification; but in habit and mode of growth very much resembling *Gymnostomum.*

Stems erect, slender, dichotomously branched, growing in dense tufts, radiculose; *branches* fastigiate.

Leaves crowded, in 3, 8, or 13 rows, lanceolate, linear-lanceolate, or subulate, semiamplexicaul and concave at the base, channelled above, spreading and incurved, contorted or crisped when dry, entire or denticulate towards the base; *areolæ* small, roundish, opaque, with chlorophyll, elongated, and diaphanous below; *nerve* reaching nearly or quite to the apex.

Inflorescence dioicous, axillary. *Barren flowers* gemmiform, shortly pedicellate, solitary, or aggregate; *antheridia* few, with filiform paraphyses. *Fertile flowers* more slender, containing 6 to 8 archegonia.

Fruit: — *Perichætium* sheathing, consisting of 9—12 leaves, the summit of a very short perichætial ramulus, rooting at the base and at length deciduous; *innermost perichætial leaves* much the longest, of thinner texture than the stem leaves, with a thinner nerve. *Vaginula* perfect, cylindrical. *Calyptra* narrow, cucullate, subulate. *Capsule* on an elongated fruitstalk, erect, oval or obovate, with a very short slightly inflated neck or apophysis, its texture thin and membranous. *Peristome* none. *Annulus* small, persistent. *Lid* conico-convex at the base, with a long slender oblique beak. *Spores* very small, reddish.

Perennial mosses, growing chiefly in the crevices of alpine rocks.

Unlike the generality of pleurocarpous mosses, this genus has the vaginula perfectly formed; whereas the fertile ramulus has in all other respects the character of a perichætial branch.

Three species of *Anœctangium* are described in the *Bryologia Europæa.* Name from ἀνοικτος, *open*, and ἀγγειον, *capsule;* from the expanded mouth of the capsule.

A. Leaves short, lanceolate.

12. 1. *Anœctangium compactum* Schwaegr. (*compact Beardless Moss*); stems densely tufted, slender, fragile; leaves lanceolate, obscurely serrulate towards the base; capsule small, oval-oblong. (Tab. VI.)

Anœctangium compactum *Schwaegr.* Suppl. t. 11. *Funck,* Deutsch. Moose, t. 5. f. 5. *Br. and Sch.* Monogr. p. 5. t. 1.
Gymnostomum compactum *Bridel.*
Zygodon compactus *C. Müller*, Syn. Musc. ii. 637.
Gymnostomum æstivum *Hedw.* Sp. Musc. t. 2. f. 4—7.? *Nees and Hornsch.* Bryol. Germ. t. 11. f. 25. *Hook. and Tayl.* tab. vi. *Weber and Mohr. Hartmann.*
Hedwigia æstiva *Hook.* Br. Fl.
Gymnostomum luteolum *Smith,* in Eng. Bot. t. 220. (fig. with a mutilated lid).
Gymnostomum tristichon *Wahlenb.* Fl. Lap.

Hab. In the crevices of alpine rocks, especially near streams or waterfalls. Fr. Autumn.

Growing in dense yellowish-green tufts. Stems 2—4 inches in length, radiculose, dichotomously branched and fastigiate. Leaves interruptedly crowded, trifarious, slightly spreading from an erect base, incurved at the top, spirally contorted and crisped when dry, lanceolate, acuminate, carinate; margin plane, slightly denticulate towards the base; elsewhere entire; when young light yellowish-green; when old brownish or lurid; the lower cellules larger than the rest, and pellucid; nerve pellucid, subexcurrent. Fruitstalks ½ inch long, pale, slender. Capsule small, oval-oblong, pale yellowish-brown, with a red mouth; at length brown, shining; smooth when dry and empty; its texture soft and membranous. Lid as long as the capsule, or longer, with an oblique slender beak. Calyptra pale. Annulus obscure.

Two exotic species, nearly allied to this, are mentioned in the *Bryologia Europæa*, viz. *A. Breutelianum* B. and S., from St. Kitts and Mexico, and *A. Liebmannianum* B. and S., from Mexico.

Bruch and Schimper reject the name *æstivum* for this moss, because it is inapplicable, and because *Gymnostomum æstivum* of Hedwig is altogether doubtful. We may here observe that Hedwig's description is borrowed in many parts from that of *Dillenius* (t. 47. f. 36.), which, according to the published report of Hooker and Arnott (*Journ. Bot.* Jan. 1834), belongs to *G. curvirostrum;* though the description of the operculum "acuminatum, breve, rubellum," is as unsuitable to that moss, as it is to *Anœctangium compactum.* The habitat of Dillenius' moss is confessedly uncertain; and he knew it only in a dried state: that of Hedwig may be totally distinct from *Anœctangium compactum*, and is probably the one found by Schreber "in argillæ fodina Lipsiæ:" the specimen figured has the capsule old, without lid, and may belong to *Tortula unguiculata* or *fallax. G. luteolum* Eng. Bot. t. 2201., was figured and described from a solitary specimen sent by the Rev. Hugh Davies, whose recorded habitat (in Dav. *Welsh Botanology*) raises a doubt whether the moss be really *Anœctangium compactum.*

B. Leaves elongated, lanceolate-subulate.

313. 2. *Anœctangium Hornschuchianum* Hoppe (*Hornschuch's Beardless Moss*); stems elongated, cæspitose; leaves linear-subulate from a dilated base, spreading, channelled, entire; capsule roundish-pyriform; lid rostrate.

Anœctangium Hornschuchiana *Hoppe and Hornsch. Br. and Sch.* Monogr. p. 6. t. 2.

Hedwigia Hornschuchiana *Schwaegr.* Suppl. t. 102. *Hook.* Musc. Exot. t. 103. (Gymnost.) *Nees and Hornsch.* Bryol. Germ. t. 11. *Bridel.*

Zygodon Hornschuchianus *C. Müller*, Syn. Musc. i. 685.

Hab. Near Killarney, *Dr. Taylor.*

The specimens received under this name from the late Dr. Taylor are barren, and after very careful comparison with authentic examples of *A. Hornschuchianum*, we are led to doubt whether the former should not be considered as a variety of *Didymodon cylindricus*, with leaves more dilated at the base, and less fragile than usual in that species, differing from those of *A. Hornschuchianum* thus: Margin minutely crenulate (not entire and smooth), subpapillose at the back; nerve narrower and more distinctly defined; areolæ smaller; texture less firm and coriaceous. The leaves of the true *A. Hornschuchianum* are channelled, rounded, not keeled at the back, straggling and tortuous when dry, of almost horny consistence, the broad thick nerve ill defined, and passing insensibly into the pagina. A nearly allied species, *A. Sendtnerianum* B. and S., has broader and more linear leaves, and a smaller oblong capsule.

SUBORDER XXX. LEUCODONTEÆ.

74. LEUCODON *Schwaegr.*

Perennial mosses, with lateral fruit, growing on rocks, and on the bark of trees. *Rhizoma* creeping. *Surculi* erect, with descending stolons near the base, simple or branched, *incurved. Leaves* densely imbricated, ovate, nerveless, plicated, entire; *areolæ* small, dot-like, especially at the marginal base; *perichætial leaves* long, sheathing, erect.

Inflorescence dioicous; *flowers* gemmiform, axillary.

Capsule erect, regular, oval-oblong, on a rather short fruitstalk. *Lid* conical, or rostellate. *Calyptra* large, coriaceous, cucullate. *Annulus* fragmentary. *Peristome* single; *teeth* 16, equidistant, entire, perforated or bifid, not hygroscopic, lanceolate, or linear-subulate, slightly trabeculate (the rudiments of an inner peristome, consisting of a very narrow membrane, occasionally visible). *Spores* rather large.

Leucodon is distinguished from *Astrodontium* of Schwaegrichen by the oblong capsule, short lid, and erect, not spreading peristome. The two species of *Sclerodontium* of Harvey, in *Musci Indici*, must be referred to *Leucodon; Sclerodontium pellucidum* of Schwaegrichen being referrible to a different family. *Leucodon lagurus* and *tomentosus* of Hooker (*Musci Exotici*) differ from *Leucodon*, as here defined, not only in habit, but in the structure of the peristome, and may properly constitute a new genus (*Lampurus MS.*). *Leucodon rugosus* and *calycinus* of the same work are properly separated into a distinct genus (*Dicnemon*) by Schwaegrichen, having the closest affinity with *Dicranum*, from which it is distinguishable chiefly by the branched creeping stems and dubiously lateral fructification. *Leucodon pallidus* of Hooker, *Musc. Exot.* is *Dicranum Sieberianum* of Hornschuch, and probably belongs to *Dicnemon*, or to an intermediate genus, of which *Syrrhopodon Taylori* Hooker, and perhaps also *Trichostomum leucoloma* Schwaegr., seem to form a part. *Pterogonium julaceum* Schwaegr. is a true *Leucodon.*

The name of the genus *Leucodon* (λευκος, *white*, οδων, *tooth*) is not strictly applicable; the peristome being usually pale yellow.

1. *Leucodon sciuroides* Schwaegr. (*Squirrel-tail Leucodon*); leaves closely imbricated, ovate-acuminate, subsecund, plicato-striate; capsule elliptic-oblong; lid conico-rostellate; teeth of the peristome perforated. (TAB. XX.)

Leucodon sciuroides *Schwaegr.* Suppl. t. 125. fig. x. y. *Funck*, Deutsch. Moose, t. 22. n. 1. *Bridel. Hook. and Tayl.*
Dicranum sciuroides *Swartz. Smith*, Eng. Bot. t. 1903.
Pterogonium sciuroides *Turner.* (Trichostomum) *Mohr.*

Hypnum sciuroides *Linn.* *Dill.* Musc. t. 41. f. 54.

var. β. morensis ; branches more robust ; leaves more crowded, less secund ; capsule elongated.

Leucodon morensis *Schwaegrichen,* Suppl. t. 125. *Bridel,* Bryol. Univ. ii. 210.

Hypnum morense *Schleicher.*

Hab. Trunks of trees, and on walls, rocks, &c., frequent ; but rare in fruit. New Forest, *Mr. Lyell.* Near Henfield, Sussex, *Mr. Borrer.* Wharfedale, Yorkshire, *John Nowell, W. Greenwood,* and *John Howorth.* Rare in Scotland. Var. β. Berkshire, 1814, with young setæ (*Herb. Turner*), and near Dorking, Surrey, *Mr. Joseph Woods.* Fr. Nov.

Stem or rhizoma creeping. Surculi or branches erect, 1 inch long or more, somewhat thickened above, incurved, especially when dry, simple or branched. Leaves imbricated in eight rows, spreading, erect when dry, more or less secund, nerveless, entire, the central areolæ narrow and elongated, those of the margin roundish and dot-like ; perichætial leaves longer, sheathing, not striated, pale and membranous. Fruitstalk ½ inch long, or more, reddish-brown. Capsule erect, regular, smooth, reddish-brown. Teeth of the peristome linear, suberect, yellowish, perforated along the middle, fragile. Annulus fragmentary. Lid conico-acuminate, short. Calyptra longer than the capsule, yellowish-brown. Infl. dioicous. The stems are very often proliferous, bearing numerous, clustered, axillary gemmæ. The young setæ are often abortive (found in this state near Matlock and Bakewell, Derbyshire).

L. morensis may perhaps be a distinct species, as Bridel maintains it to be. He gives the following characters: Stem less elongated. Branches thicker, less curved when dry. Leaves shorter, broader, more evidently octofarious, not secund, straight, not oblique at the apex. Capsule longer, narrower, oblong-cylindrical, paler, always slightly curved when dry. Teeth of the peristome not perforated, bifid.

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2. *Leucodon Lagurus* Hooker (*Hare-tailed Leucodon*) ; stem irregularly branched, tomentous ; leaves without striæ, ovate-oblong, concave, suddenly acuminate or piliferous, serrulate above, nerved half-way ; capsule erect, cylindrical ; lid conical, with a short beak. (TAB. LXI.)

L. Lagurus *Hook.* Musc. Exot. t. 126. *Schwaegr.* Suppl. t. 133.

var. β. borealis; stem not tomentous; branches tumid; leaves auriculate and serrated at the base, more concave, more suddenly attenuated, with longer points, faintly 2-nerved at the base only.

Hypnum cirrhosum of *Edinb. Bot. Society.*

Hab. On rocks and trees. Var. β. found in North Uist, Hebrides, on the N. W. shore, opposite St. Kilda, on a wettish rock about eighty yards from the sea ; abundant, but barren ; Aug. 26. 1851; *Rev. Dr. C. Smith.*

This interesting moss, being barren in the only British locality where it is found, and in the structure of the peristome scarcely referrible to any other described genus, is retained here for the present; although, according to the above definition of the genus *Leucodon*, it must be regarded as an anomalous species.

The stems grow thickly matted together, 1—2 inches high, and in the fertile specimens from Cape Horn are thickly beset with ferruginous down. Branches erect, tumid, bright green. Leaves entirely destitute of striæ, smooth and glossy, scarcely altered when dry, of thin membranous texture; areolæ narrow, oblong-rhomboid; nerve variable, often forked and short, sometimes wanting. Fruitstalk ¾ in. long. Peristome pale or yellowish, consisting of 16 linear, carinate, membranous teeth, more or less lacunose along the medial line, sometimes cloven, connected at the base by a short membrane rising above the orifice of the capsule, so as to resemble the inner peristome of a *Neckera* or *Leskea*, to which, indeed, it may be analogous. Calyptra whitish, dimidiate, nearly as long as the capsule. Inflorescence apparently dioicous. This has not been found elsewhere in the Northern Hemisphere, and is a very interesting addition to the list of British mosses.

Our var. β. is assuredly distinct from *Hypnum cirrhosum* of Schwaegr. It may eventually prove to be new; but, if so, its generic place is questionable.

75. ANTITRICHIA *Bridel*, Bryol. Eur.

Anomodon *Hook. and Tayl.*

Stems procumbent, or ascending, pinnatedly branched, growing from a creeping rhizoma, and sending out stolons near the base.

Leaves ovate, ovate-lanceolate, or lanceolate, denticulate or serrated, variously nerved; *areolæ* small. *Perichætial leaves*, longer, sheathing.

Inflorescence dioicous. *Flowers* axillary, gemmiform.

Capsule oval, regular, on a short curved fruitstalk. *Annulus* none. *Lid* obliquely rostrate. *Calyptra* rather large, cucullate. *Peristome* double; *outer teeth* 16, tapering, marked with a medial line; *inner peristome* consisting of 16 narrow filiform processes alternating with the outer teeth, united at the base by a very obscure narrow membrane, more or less adhering to the outer peristome.

Perennial mosses, growing on rocks and trees.

Antitrichia appears to us not distinguishable from *Cyrtopus*, a division of the Bridelian genus *Neckera* Bryol. Univ.; there being nothing in the structure of the inner peristome to justify the separation, except its frequent adhesion to the outer peristome. This genus has some affinity with *Leucodon*, especially in the calyptra and perichætium, but is very different in the structure of the peristome. The procumbent pinnated stems and short curved fruitstalks distinguish it from *Anomodon*. The name of the genus, from άντι, *opposite*, ϑριξ, *cilia*, is inapplicable to the true structure of the peristome.

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Antitrichia curtipendula Bridel (*pendulous Wing-Moss*); stem procumbent, pinnatedly branched; branches spreading; leaves ovate-acuminate, spreading, ciliato-denticulate above, margin recurved, nerve ceasing above the middle; capsule drooping, elliptical; lid obliquely rostrate. (TAB. XXII.)

Antitrichia curtipendula *Bridel*, Br. Univ. ii. 222. *Bryol. Eur.*
Anomodon curtipendulus *Hook and Tayl.* t. xxii.
Neckera curtipendula *Hedw. Turner. Smith*, Eng. Bot. t. 1444. *Funck*, Deutsch. Moose, t. 34. f. 5. *Schwaegr.*
Hypnum curtipendulum *Linn. Dill.* Musc. t. 43. f. 69.

Hab. On rocks and trees; frequent in mountainous districts; not very common in fruit. Dartmore Forest, Devonshire. Near Dolgelley. Near Llanberis. Ambleside. Breiddin Hill, Montgomeryshire. Fr. April.

Stems 3—8 inches long, or more, straggling and procumbent, dark or yellowish green; the branches spreading, somewhat curved, and more or less regularly bifarious. Leaves concave, erect when dry, curiously ciliato-dentate above, and the narrow apex terminating in a double hook (visible only on the younger leaves), by which character this moss is readily distinguished from all others; nerve sometimes trifid at the base; areolæ small, elliptical. Fruitstalk curved, short, not much exceeding the perichætium in length. Outer peristome yellow; the teeth dilated and confluent at the base, longer than the inner cilia, which, though very narrow, are somewhat perforated and carinate. Lid half as long as the capsule, obliquely rostrate. Calyptra rather shorter than the capsule, firm, yellowish-brown. Spores rather large. Barren-flowered plants with numerous gemmiform axillary flowers.

If sufficiently ripe specimens are examined, the inner peristome may always be detached entire, and (as in all cases where it exists at all) is manifestly continuous with the sporangial membrane.

Var. β. hispanica Bryol. Eur., with leaves shorter and broader, imbricated when dry; capsule cylindrical, on a shorter straight fruitstalk; has been found at Balcombe, Sussex, March 1849, by Mr. Mitten.

76. LEPTODON *Bridel.*

PTEROGONIUM (partly) *Hook. and Tayl.*

Stems or *surculi* pinnatedly branched, growing from a creeping rhizoma, and putting out stolons near the base; *branches* incurved or straight when dry.

Leaves ovate, obtuse, or acute, entire, shortly nerved; *areolæ* small, dot-like.

Inflorescence dioicous. *Flowers* axillary, gemmiform.

Capsule elliptical, regular, on a short fruitstalk. *Annulus* none. *Lid* rostrate. *Calyptra* hairy, cucullate. *Peristome* single (with traces of an inner peristome, visible as a narrow laciniated membrane); *teeth* 16, pale, linear-lanceolate, entire or fissile, marked with a medial line, converging, scarcely hygrometric. *Vaginula* hairy.

The genus *Leptodon* (from λεπτος, *narrow*, οδων, *tooth*) appears to us not really different from *Lasia* of Bridel, who was mistaken in ascribing a mitriform calyptra to *Lasia;* for it is dimidiate in all the species; and we had selected the latter name as the most apposite; but for the sake of uniformity, we adopt the name published in *Bryol. Europ.* The genus is allied to *Pilotrichum* of Bridel, and is perhaps not distinguishable from it, except in the almost simple peristome, and less procumbent habit. The species are perennial, growing on the bark of trees.

17. *Leptodon Smithii* Bridel (*curled Wing-Moss*); stems once or twice pinnatedly branched; branches much incurved when dry; leaves roundish-ovate, very obtuse, entire, margin recurved below, nerve ceasing above the middle; fruitstalk very short; capsule elliptical; lid rostrate. (TAB. XIV.)

Leptodon Smithii *Bridel,* Bryol. Univ. ii. 197. *Bryol. Eur.*
Lasia Smithii *Bridel,* Mant. Musc. p. 133.
Pterogonium Smithii *Swartz. Smith,* Eng. Bot. t. 1326. *Schwaegr.* Suppl. t. 109. *Hook. and Tayl.* tab. xiv.
Hypnum Smithii *Dicks.* Crypt. Fasc. 2. p. 10. t. 5. f. 4. *Hedw.* Sp. Musc. t. 68.
Pilotrichum Smithii *Pal. Beauv.*

Hab. Trunks of trees in the southern parts of England; abundant in Devonshire. Fr. April.

Rhizoma creeping, and adhering very closely to the soft bark of the trees on which it grows. Stems or surculi 1—3 inches long, the branches much crowded, pinnate or bipinnate, elastic, much incurved or curled when dry, so as often to conceal the fruit. Leaves not distichous as Bridel describes them, but disposed in 8 rows ($\frac{3}{8}$), and directed upwards, parabolic, rounded and obtuse at the apex, somewhat striated when dry, the nerve continued beyond the middle. Perichætial leaves erect, ovate, with a subulate apex, almost as long as the fruitstalk, which is slightly curved. Vaginula very hairy. Peristome suberect, slightly recurved when dry, pale. Lid obliquely rostrate, shorter than the capsule. Calyptra yellowish, hairy. Spores rather large, greenish. Inflorescence dioicous.

Leptodon longisetus of Montagne, from the Canaries, is nearly allied to this, but differs considerably in habit; having the branches distant, simple, filiform, nearly straight when dry, and the fruitstalk elongated.

77. ANOMODON *Hook. and Tayl.*

NECKERA (partly) *Hedw., Bridel,* &c.

Rhizoma creeping. *Stems* or *surculi* erect, elongated, simple, or sparingly and irregularly branched, rigid, and somewhat fragile, with descending stolons from the lower part.

Leaves spreading, ovate-lingulate, or ovate-lanceolate, obtuse, or acute, entire, nerved almost or quite to the apex; *areolæ* very small, dense, and opaque.

Inflorescence dioicous; *flowers* axillary, gemmiform.

Capsule erect, oval-oblong, regular, on an elongated fruitstalk. *Calyptra* cucullate, small, membranous, naked. *Lid* conico-rostellate. *Annulus* small, fragmentary. *Peristome* double; *outer teeth* 16, narrow, marked with a medial line, scarcely hygroscopic, not obviously trabeculate internally; *inner peristome* composed of the same number of short, fragile, and fugacious ciliary processes, alternating with the outer teeth, and more or less adhering to them, connected at the base by a very obscure and narrow membrane. *Spores* rather small.

Perennial mosses, growing on rocks, and on the bark of trees.

The name of this genus (from *ανομος*, *irregular*, *οδων*, *tooth*) was adopted in the *Muscologia Britannica*, in consequence of an apparent diversity in the structure of the peristome from that of *Neckera* of Bridel; but it having since been ascertained that a true inner peristome exists in *Anomodon*, the name is retained here rather to avoid the inconvenience of change, than for its significance, as in the case of *Schistostega*. The genus *Anomodon* is chiefly intelligible as having a certain peculiarity of habit which connects it on the one hand with *Leskia* and on the other with *Leucodon*. The colour of the foliage is an almost verdigris-green, turning yellowish or reddish when old. *Leskia rostrata* Hedw. and *L. attenuata* Hedw. probably belong to this genus; or differ only in the structure of the inner peristome.

318. 1. *Anomodon viticulosus* Hook. and Tayl. (*tall Anomodon*); stems elongated, sparingly branched; leaves spreading, subsecund, ovate-lingulate, rather obtuse, entire, the pellucid nerve ceasing below the apex; fruitstalk slender, elongated; capsule erect, subcylindrical; lid conico-rostellate. (Tab. XXII.)

Anomodon viticulosum *Hook. and Tayl.* Musc. Brit. ed. 2. p. 138. t. 22.
Neckera viticulosa *Hedw.* Sp. Musc. t. 48. *Turner. Smith. Funck*, Deutsch. Moose, t. 34. f. 4. *Bridel. Schwaegr. Swartz*, &c.
Hypnum viticulosum *Linn.* Eng. Bot. t. 265. *Dill.* Musc. t. 39. f. 43.

Hab. On shady rocks and trees, chiefly in limestone districts; not common in fruit. Fr. Nov.

Stems or surculi 1 or 2 inches long, erect from a creeping rhizoma, somewhat rigid and brittle, especially when dry; sparingly branched, loosely tufted, slightly flexuose or curved. Leaves light or verdigris green when young, yellowish when old, spreading, more or less secund; narrow and almost subulate above from an ovate base; areolæ small and opaque; the nerve pellucid. Perichætial leaves longer, and more attenuated above. Fruitstalk yellowish, above ½ inch long. Capsule chestnut-coloured, subcylindrical, erect, straight and symmetrical; or occasionally a little bent. Peristome yellow; inner cilia shorter than the outer teeth, very narrow and fragile. Lid about one-third the length of the capsule. Calyptra pale, dimidiate. Spores small. Inflorescence dioicous.

Neckera minor P. Beauv., Bridel (Drummond *Musc. Americ.* No. 163.), differs thus from the above: Leaves subcomplanate, not secund, very obtuse, wider above, nerve shorter; capsule elliptical; inner peristome wanting, or more fugacious; stature more dwarfish and more robust. *Leskea attenuata* Hedwig, has fasciculate incurved branches; leaves broader, more acute, more erect when dry; inner peristome more evident and persistent.

19. 2. *Anomodon longifolius* Hartmann (*long-leaved Anomodon*); stems loosely tufted, slender, elongated; branches somewhat fasciculate; leaves subsecund, ovate-lanceolate, acuminated, nerved to the apex; fruitstalk rather short; capsule erect, oval-oblong; lid conico-rostellate. (TAB. LIV.)

Anomodon longifolia *Hartm.* Fl. Scandin.
Leskia longifolia *Bruch and Schimp. MS.*
Hypnum attenuatum *Smith,* Fl. Brit. *Dickson* (not Eng. Bot. t. 2420.?).
Hypnum catenulatum *W. Gardiner MS.*

Hab. Ben Lawers, on rocks, barren, *Dr. Greville.* Den of Airly, barren, *W. Gardiner.* Fruit rare, and not yet observed in Britain. Fr. Autumn?

Stems or surculi more crowded than in the last, very slender, with more numerous fascicled and attenuated branches, the lower foliage of a bright tawny or reddish colour, beautifully contrasting with the verdigris-green of the younger leaves. Leaves moderately spreading and secund, more erect when dry, tapering from an ovate base, very acute, entire; margin scarcely reflexed when dry; nerve subcontinuous; reticulation small, dotted. Perichætial leaves longer, attenuated and secund in the upper part. Fruitstalk less than ½ inch in length, slender, yellowish. Capsule smaller and shorter than in the preceding, ovate-oblong, erect, reddish. Operculum about one third as long. Annulus obscure. Peristome yellow; inner cilia half as long as the outer teeth. Calyptra dimidiate. Spores larger than in the preceding. Inflorescence dioicous.

This moss is sufficiently distinct from *Hypnum catenulatum* Schwaegrichen, in the much longer secund leaves, and in the whole habit, which slightly resembles that of *Hypnum atrovirens*, with which it agrees in the form, though not in the texture nor in the colour of the leaves, and may thus have been frequently mistaken for a variety of that moss. At present it seems to be very little known; and the fruit is probably of rare occurrence.

Dickson's specimen, figured as *Hypnum attenuatum* in Eng. Bot. t. 2420., appears to be *Leskea rostrata*, and is probably foreign. The specimen in *Herb. Smith*, however, certainly belongs to *Anomodon longifolius.* Dickson communicated two different mosses named *H. attenuatum* to Mr. Turner, neither of which belongs to *Leskea attenuata* of Hedwig.

SUBORDER XXXI. ISOTHECIEÆ.

The mosses included in this family are distinguished from the *Hypneæ* by their capsules, which are with few exceptions erect and symmetrical. It is difficult to fix the line of separation between this group and the *Leucodonteæ;* and perhaps both should be united into one; notwithstanding the contrary opinion expressed by Bridel in the *Bryologia Universa.*

78. PTEROGONIUM *Swartz, Hook. and Tayl., &c.*
Wing Moss.

LEPTOHYMENIUM *Huebener*, &c.

Capsule erect, oblong, symmetrical, on an elongated fruitstalk. *Lid* conical, or rostellate. *Annulus* imperfect, or fragmentary. *Calyptra* cucullate. *Peristome* double; outer *teeth* 16, short, scarcely hygrometric, linear-lanceolate, trabeculate; *inner membrane* short and irregular, with 16 narrow short processes more or less adherent to the outer teeth. *Spores* small.

Stems erect from a creeping rhizoma, almost naked below, branched and incurved above; *branches* fasciculate, incurved, especially when dry.

Leaves ovate, or elliptical, concave, spreading, or subsecund, serrulate, sometimes papillose, two-nerved at the base, or sometimes with a single nerve ceasing near the middle; *areolæ* small and dot-like.

Inflorescence dioicous; *flowers* axillary, gemmiform, on the branches and upper part of the stem.

Perennial mosses, growing on rocks, and on the bark of trees.

320. 1. *Pterogonium filiforme* Hedw. (*thread-like Wing-Moss*); stem with fasciculate, incurved, filiform branches; leaves subsecund, elliptical, acuminate, concave, papillose, serrulate at the apex, margin recurved, the nerve reaching half-way, or two-nerved at the base; capsule elliptic-oblong; lid rostrate. (TAB. XIV.)

Pterogonium filiforme *Hedw.* St. Crypt. iv. t. 7. *Eng. Bot.* t. 2297. (as to the foreign specimen only). *Schwaegr. Funck,* Deutsch. Moose, t. 13. f. 1. *Hook. and Tayl.*
Pt. cæspitosum *Eng. Bot.* t. 2526.
Pterigynandrum filiforme *Hedw. Bridel. Bryol. Europ.*
Grimmia filiformis *Web. and Mohr.*
Hypnum cylindricum *Dicks.* Crypt. Fasc. ii. p. 12. (Herb. Turner.) *Smith.*
H. filiforme *Timm. Hoffm.*
Leskia cylindrica *Bridel,* Sp. Musc.
Maschalanthus filiformis *Schultz.*

Hab. On rocks, and on the trunks of trees. Mountains of Scotland and Ireland. Ben Lawers, &c., common; *Arnott and Greville.* Rare in fruit. Fr. Spring.

Dioicous. Stems slender, more or less compactly tufted, arched, with occasional descending stolons near the base, branched in the upper part; the branches somewhat fasciculate, incurved, slender, more or less attenuated. Leaves crowded, green or yellowish, sometimes fulvous, not glossy, slightly imbricated, often secund, appressed when dry, papillose at the back, the margins recurved, shortly two-nerved at the base; or with a longer single nerve, extending nearly half-way. Perichætial leaves pale and sheathing, erect. Fruitstalk $\frac{3}{4}$ in. long, pale reddish, slender, twisted to the left. Capsule erect, pale brown. Annulus obscure. Lid one third as long as the capsule, obliquely rostrate, conical at the base. Peristome small, pale yellow; inner peristome very short and indistinct; sometimes with short ciliary processes, alternating with the outer teeth. Calyptra large, longer than the capsule, somewhat inflated when young, dimidiate, pale, membranous. Spores small.

Distinguished from *L. gracile* by the more slender habit; by the elliptical papillose leaves with recurved margins; paler and more delicate capsules, and longer rostrate lid. It varies in size according to situation; and sometimes, in the larger forms especially, the leaves are decidedly secund: in this state it is *P. helveticum* Hook. MSS. in *Herb. Hooker*, having the inner peristome as in *Leskea.* Dickson's *Hypnum cylindricum* is the most slender and delicate form of the species; and *Pterogon. cæspitosum* is an intermediate form, without fruit, gathered by Mr. Borrer, near Dulsie Bridge, Scotland. The figure in *English Botany*, as to Mr. Mackay's Irish specimen, and also *Pterogon. heteropterum* of Schwaegrichen, belong to *Hypnum catenulatum* of Hooker and Taylor (*H. heteropterum*).

2. *Pterogonium gracile* Sw. (*slender Wing-Moss*); stems arcuate, with fasciculate incurved branches; leaves closely imbricated, ovate, acute, concave, serrated above, with plane margins, faintly two-nerved at the base; capsule oblong; lid conical, apiculate. (TAB. XIV.)

Pterogonium gracile *Swartz. Smith*, Eng. Bot. t. 1085. *Schwaegr. Hook. and Tayl. Funck*, Deutsch. Moose, t. 13. f. 5. *Bryol. Eur.*
Pterigynandrum gracile *Hedw.* St. Crypt. iv. t. 6. *Bridel.*
Grimmia ornithopodioides *Web. and Mohr. Schkuhr*, Deut. Moose, t. 27.
Hypnum gracile *Linn. Dill.* Musc. t. 41. f. 55. A,
Encalypta gracilis *Roth.*

Hab. On shady rocks and on walls, in subalpine districts; frequent. Sometimes on trunks of trees; not common in fruit. Fr. Nov.

Dioicous. Stems growing from a creeping rhizoma, with descending stolons near the base; arched above, with incurved fasciculate branches in the upper part; almost naked below, 1 or 2 inches in height; when dry elastic, the branches still more incurved. Leaves spreading when moist; erect and closely appressed when dry; glossy, the margins plane; areolæ elliptical. Perichætial leaves erect, yellowish. Fruitstalk ½ inch long, red, twisting to the right. Capsule chestnut-coloured, more elongated than in the preceding species, and of thicker texture; with a shorter scarcely rostellate lid; about one quarter as long as the capsule. Annulus fragmentary. Peristome small, yellow; inner membrane sometimes half as long as the outer teeth, with frequent rudiments of cilia. Calyptra dimidiate, whitish, smaller and narrower than in the preceding; sometimes slightly hairy.

The smooth, glossy, not papillose, plane-margined leaves, distinguish this from the preceding species. The position of the fruitstalks in the two species, and the different texture of the leaves, are now adopted in *Bryol. Europ.* as marks of distinct genera. In *P. gracile* the fructification is said to be on the secondary or upright stem, and in *P. filiforme* on the primary or horizontal stem.

79. ISOTHECIUM *Bridel.* Frond-Moss.

Hypnum (partly) *Hook. and Tayl.*

Capsule regular and symmetrical, mostly erect, on an elongated fruitstalk. *Annulus* dehiscent. *Lid* rostrate. *Calyptra* cucullate. *Peristome,* as in *Hypnum,* double; *outer* of 16 hygrometric trabeculate *teeth,* marked with a medial line, and composed of two layers of cellules, of which the outermost are more dense in texture and more deeply coloured; *inner peristome* a membrane divided half-way down into 16 carinate perforated processes, with intermediate cilia two or three together. *Spores* small.

Stems more or less dendroid, growing from a creeping rhizoma, with occasional descending stolons from the lower part, which is bare of branches; *branches* fasciculate, or disposed in some species in a pinnate manner, occasionally incurved.

Leaves ovate, or ovate-lanceolate, more or less acute, serrated, nerved almost to the apex; *areolæ* elliptical, or oblong.

Inflorescence dioicous; *flowers* axillary, gemmiform, inserted on the branches, or on the upper part of the stem.

Perennial mosses, growing on rocks, and on trees.

This genus (named from *ίσος, equal, ϑηκη, capsule*) is closely allied to *Pterogonium* in habit, and differs chiefly in the more perfect development of the peristome and annulus. For the sake of brevity, we have followed Bridel in retaining *H. alopecurum* as a species of *Isothecium;* though we quite approve of its being placed, with several exotic species of similar habit, in a separate group, as is done in *Bryol. Europ.* under the name *Thamnium* (from *ϑαμνος, a shrub*), which well expresses the dendroid habit of the group; differing from *Isothecium* in the usually complanate disposition of the branches which occupy the upper half of the rigid stem, the lower portion of which bears only a few scale-like leaves; and in the somewhat complanate foliage of the branches.

22. 1. *Isothecium myurum* Dill., Bridel (*blunt-leaved Frond-Moss*); stems with fasciculate incurved branches; leaves ovate-oblong, or elliptical, concave, subserrulate, nerved half-way; perichætial leaves erect; capsule erect. (TAB. XXV.)

Isothecium myurum *Bridel*, Br. Univ. ii. 367.
Hypnum myurum *Pollich*. Pl. Pal. 3. No. 1054. f. 8. *Bridel*, Mant. *Schultz. Schrank. Röhling. La Mark and Cand. Savi. P. Beauv.*
H. myosuroides *Schreb. Hedw.* St. Crypt. iv. t. 8. *Schrader. Roth. Hoffm. Dill.* Musc. t. 41. f. 50.
H. curvatum *Swartz. Turner. Smith*, Eng. Bot. t. 1566. *Funck*, Deutsch. Moose, t. 46. f. 52. *Web. and Mohr. Schwaegr. Hook. and Tayl.*

Hab. On trees and rocks. Fr. October.

Stems 1 or 2 inches high, growing from a creeping rhizoma, with descending stolons near the base, branched above; branches fasciculate, incurved. Leaves elliptical, rather acute, but not tapering at the summit, which is slightly serrulate; margin recurved towards the base; nerve single or forked, ceasing half-way up the leaf; sometimes longer. Perichætium erect, by which character, as pointed out by Turner, this species is readily distinguished from the next. Fruit-stalk ½ inch long. Capsule ovate, tapering below, nearly or quite erect, regular, or sometimes slightly bent; with a rostrate lid, about half its own length or longer. Annulus dehiscent. Outer teeth very thin and pellucid, pale yellow, adhering usually to the inner peristome, or sometimes defective or absent, scarcely trabeculate; inner peristome, when perfect, as long as the outer teeth, with very small obscure cilia; frequently absent. Spores small. Inflorescence dioicous.

3. 2. *Isothecium myosuroides* Dill., Linn. (*acute-leaved Frond-Moss*); stems more slender; branches fasciculate, filiform, incurved; leaves ovate-acuminate, serrulate, nerved beyond the middle; perichætial leaves recurved; capsule elliptic-oblong, erect or inclined; lid rostrate. (TAB. XXV.)

Isothecium myosuroides *Bridel*, Bryol. Univ. ii. 369.
Hypnum myosuroides *Linn.* (not of *Hedw.*) *Turner. Smith*, Eng. Bot. t. 1567. *Funck*, Deutsch. Moose, t. 46. f. 53. *Schwaegr. Web. and Mohr. Bridel*, Mant. *Hook. and Tayl. Dill.* Musc. t. 41. f. 51.
H. alopecurum β. protensum *Turner*, Musc. Hib. p. 164. (var. with flagelliform elongated branches).

Hab. On trunks of trees and on rocks. Fr. Nov.

Dioicous. Stems and fascicled branches more slender than in the preceding. Leaves more spreading, tapering gradually from an ovate base, more distinctly serrulate, with a more conspicuous, single nerve; perichætial leaves much reflexed. Capsule more inclined, not always symmetrical. Fruitstalk mostly curved, ½ inch long. Lid as in the preceding species. Peristome perfectly formed, as in *Hypnum*. Annulus distinct.

Sufficiently distinct from the preceding in the form of the leaf, as well as in other characters. Possibly *H. stoloniferum* Hook. *Musc. Exot.*, from the Rocky Mountains and north-west coast of America, may be only a large luxuriant state of this species.

324. 3. *Isothecium alopecurum* Dill., Linn. (*Foxtail Frond-Moss*); stem dendroid, naked below, pinnatedly branched above; branches slightly incurved; leaves spreading, ovate-lanceolate, serrated, the nerve ceasing below the apex; capsule ovate, more or less inclined; lid rostrate. (TAB. XXV.)

Thamnium alopecurum *Bryol. Eur.*
Hypnum alopecurum *Linn. Turner. Smith*, Eng. Bot. t. 1182. *Funck*, Deutsch. Moose, t. 45. f. 51. *Schwaegr. Bridel. Hook. and Tayl. Dill.* Musc. t. 41. f. 49.
Hypnum lætevirens *Turner*, Musc. Hib. p. 149. t. 13. fig. *a. c. d.* (not *Smith*, nor Eng. Bot.)

Hab. In moist shady woods, on rocks, &c. Fr. Nov.

Dioicous. Stems 2 or 3 inches in height, growing from a creeping rhizoma, with occasional stolons near the base; naked in the lower part, with numerous branches above, disposed in a pinnate manner; the branched part almost horizontal; branches and foliage somewhat complanate. Leaves of the stem scattered and scale-like below; upper leaves more crowded, ovate-lanceolate, slightly concave, distinctly serrated above, dark green; nerve strong, reaching almost to the apex; areolæ elliptical. Fruitstalks numerous, arising from the upper branched part of the stem, and from the branches; less than an inch long, reddish, more or less curved at the top. Capsule ovate, erect, or inclined, more or less symmetrical, reddish brown. Peristome as in *Hypnum*. Annulus obscure. Lid with an oblique beak. Calyptra dimidiate.

This fine moss is not likely to be confounded with any other British species; being sufficiently distinct from *Climacium dendroides* in the pinnate or complanate ramification, and the short ovate capsules. It is so closely allied to *Hypnum neckeroides* Hook. *Musc. Exot.*, which Bridel has already placed in the genus *Isothecium*, that they ought not to be separated in a natural arrangement. Several exotic species referred to *Leskea* and *Neckera*, in *Hooker. Musc. Exot*, and in other publications, belong to the same group, notwithstanding the absence of cilia from the inner peristome, as Bridel properly remarks, in *Bryol. Univ.* (ii. 373.). *Hypnum fasciculatum* of Swartz must also be referred to this genus; but *Hypnum comosum* and *H. Menziesii* may belong to a genus distinct from *Isothecium;* and all the species of Bridel's second division (b. *ramis angulatis*) belong to *Pilotrichum;* the calyptra being hairy, the fruitstalk short, and the habit such as is proper to that genus.

Hypnum alopecurum var. β. protensum Turn. *Musc. Hib.* belongs to the preceding species.

80. CLIMACIUM *Web. and Mohr.*

HYPNUM *Hook. and Tayl., &c.*
LESKEA *Hedw.*

A genus of pleurocarpous mosses, remarkable for their tree-like habit, bearing numerous straight erect capsules, on long fruitstalks, which arise from the upper part of the stem and from the base of the branches.

Rhizoma or *stolon* creeping, subterraneous. *Stems* bare of branches below, more or less branched at the summit.

Leaves of the stolons and of the *lower part of the stems* small, appressed, scale-like, in 8 rows; *upper leaves* larger, in 13 rows, erecto-patent, ovate-lanceolate, or somewhat cordate, concave, with 2 plicæ, nerved, serrulate above; *areolæ* narrow.

Inflorescence dioicous; *flowers* gemmiform, axillary.

Capsules numerous, erect, on long fruitstalks, oval-oblong or subcylindrical, symmetrical, or sometimes slightly curved. *Annullus* none. *Lid* conico-rostellate, persistent on the summit of the columella. *Calyptra* longer than the capsule, dimidiate, somewhat twisted, embracing the fruitstalk below the capsule, and persistent. *Peristome* double; *outer teeth* 16, long, linear-lanceolate, confluent at the base, closely trabeculate, marked vertically with a medial line, connivent when moist, incurved when dry; *inner peristome* composed of 16 linear-lanceolate, carinate, lacunose processes, longer than the outer teeth and alternating with them, connected at the base by a narrow membrane, the two segments of each process united only at the apex. *Columella* exserted. *Spores* small, greenish. *Perichætial leaves* nerveless, entire, sheathing.

This genus (named from κλιμαξ, *a ladder*, in allusion to the appearance of the processes of the inner peristome) is allied to *Isothecium alopecurum*, but is distinguished from that and from the dendroid species of *Hypnum*, in the following particulars. The branches of the stem are not bifarious, but spreading in all directions; and the stem itself, after having produced its fruit, does not produce innovations; unless indeed after having become prostrate and covered with soil, when it becomes virtually a rhizoma, and produces lateral shoots which may grow up into fertile stems; presenting considerable analogy in its mode of vegetation to *Mnium undulatum*. The complete absence of an annulus, and of cilia to the inner peristome, together with the large calyptra, and the adhesion of the lid to the columella, are also distinctive. Only two species are known.

Climacium dendroides Web. and Mohr (*Marsh Tree-Moss*); leaves ovate-lanceolate, spreading, serrulate at the apex; perichætial leaves nerveless, entire; capsule oval-oblong. (TAB. XXV.)

Climacium dendroides *Web. and Mohr,* Iter. Suec. p. 96. Bot. Tasch. p. 252. *Schwaegr.* Suppl. t. 81. *Funck,* Deutsch. Moose, t. 33. f. 1. *Bridel. Br. and Sch.* Monogr. p. 5. t. 1.
Leskea dendroides *Hedw.* Sp. Musc. *Wahlenb.*
Hypnum dendroides *Dill.* Musc. t. 40. f. 48. *Linn. Turner. Smith,* Eng. Bot. t. 1565. *Hook. and Tayl.*
Neckera dendroides *Swartz.*

Hab. In boggy or marshy places; not common in fruit.
Fr. October.

Stems 2 or 3 inches high, much branched at the summit; branches nearly an inch long. Leaves of the branches rather obtuse, those of the stem more acute, ovate-lanceolate, moderately spreading, serrulate at the apex, somewhat plicate, the nerve ceasing near the apex. Fruitstalks numerous, about 1 inch long. Capsules erect, chestnut-coloured. Columella elongated when dry, raising up the lid which adheres to it. Outer peristome reddish; inner yellow.

C. americanum has more elongated capsules; leaves cordate-auriculate and dilated at the base, appressed and erect when dry, more evidently plicate; branches attenuated.

81. CYLINDROTHECIUM *Bryol. Eur.*

NECKERA (partly) *Bridel, Schwaegr., &c.*
ISOTHECIUM *Montagne.*
ENTODON *C. Müller.*

Peristome double; *outer teeth* 16, linear-lanceolate, *not hygrometric,* externally trabeculate, rigid, fissile at the apex, *inserted below the orifice of the capsule; inner peristome* consisting of 16 narrow cilia, alternating with the outer teeth, of equal length, somewhat carinate, and marked with a medial line; often more deeply coloured than the outer peristome. *Capsule* erect, cylindrical, regular. *Annulus* present, sometimes wanting. *Columella* exserted. *Lid* conico-rostellate, short. *Calyptra* dimidiate. *Fruitstalk* more or less elongated, straight.

Stem mostly compressed, decumbent or procumbent, pinnatedly branched.

Leaves ovate, membranaceous, shining, two-nerved at the base; *areolæ* narrow and elongated, those at the base larger, subquadrate, and pellucid.

Inflorescence monoicous, or dioicous; *flowers* gemmiform, axillary, from the lower part of the stem.

This genus, though allied to certain species of *Leskea,* is marked by a certain peculiarity of habit; very distinct from the other mosses referred by Bridel to the genus *Neckera;* having the stems usually procumbent, pinnatedly branched, with compressed glossy foliage; leaves almost nerveless and entire; peristome inserted below the orifice of the capsule, not hygrometric; and the inner peristome deeply coloured. All the species when moist are said to have a fœtid odour. Only two European species are known.

26. *Cylindrothecium Montagnei* Bryol. Eur. (*Montagne's Cylinder-Moss*); dioicous; stems pinnatedly branched; branches recurved, acute; leaves imbricated, erecto-patent, elliptical, subacute, entire, faintly two-nerved at the base; capsule erect, cylindrical; lid conico-acuminate; cilia of the inner peristome carinate, rather broad. (TAB. LIV.)

Entodon Montagnei *C. Müll.* Linnæa, 1844, p. 704.
Entodon insidiosus *Spruce,* in Annals of Nat. Hist. vol. 3. p. 149.
Isothecium insidiosum *Montagne,* in Ann. Sc. Nat. 1843. Bot. tom. 20. tab. 15. cent. 4. no. 17.
Hypnum Schreberi var. γ. orthocarpum *Bridel,* Bryol. Univ.

Hab. On rocks and hills, chiefly in limestone or chalky districts. Near the summit of Ben Lawers, 1836, *W. Wilson.* Welburn, near York, *Mr. Spruce.* Near Hurst Pierpoint, on Woolsonbury Hill, Sussex, *Mr. Mitten.* Not found any where with fruit in Britain. Fr. Autumn.

Growing in bright, glossy, yellowish-green patches; the older leaves in the lower parts of the stem yellowish-brown. Stems 2 inches long or more, flexible, with numerous short, simple, recurved, acute branches, approaching in this respect to *Hypnum cuspidatum,* as well as to *H. Schreberi,* which the plant considerably resembles. Leaves shining, yellowish-green, elliptical, almost obtuse and entire at the apex; margin plane, except at the base, where it is recurved; very faintly 2-nerved at the base, or sometimes nerveless; marginal cellules at the base of the leaf enlarged and pellucid, as in others of the genus. Fruitstalk about 1 inch long. We have seen only the fertile-flowered plant.

In the barren state this is readily distinguished from *Hypnum Schreberi* by the pale (not red) stem, and by the more cuspidate extremities of the branches. It resembles *Neckera flavescens* Hook. (*Lin. Trans.* not of *Musc. Exot.*) and Schwaegr. (*Suppl.* t. 141.); but in that moss, which also belongs to *Cylindrothecium,* the leaves are acute and complanate, as in *C. cladorrhizans,* the other European species, which is not found in Britain. The fruit found by *Lapylaie,* near Paris, is extremely rare; but has been recently found at the Castle of Chillon, Lake Leman, and in the Jura Mountains. (v. *Bryol. Europ.*)

82. LESKEA *Hedw. Brid.*

HYPNUM (partly) *Hook. and Tayl.*

Capsule erect, more or less symmetrical; on an elongated straight fruitstalk arising from the lower part of the stem. *Lid* conical, short. *Annulus* obscure or wanting. *Calyptra* dimidiate. *Peristome* double; *outer teeth* 16, narrow, pale, trabeculated within; *inner peristome* a membrane more or less deeply divided into 16 carinate processes, without (rarely with) intermediate cilia.

Stems mostly creeping, irregularly branched, sometimes slightly pinnate; *branches* simple, mostly erect.

Leaves mostly ovate, nerved or nerveless, entire.

Inflorescence monoicous or dioicous. *Fertile flowers* axillary, inserted on the lower part of the stem. *Barren flowers* gemmiform, axillary on the stem, or on the branches.

This genus, named in memory of *Leské*, a Professor at Leipsic, has often been blended with *Hypnum*; and indeed the limits of the two groups are not very well marked. We propose here to include only such species as, in connection with an erect capsule, have a creeping or vaguely branched stem, and short conical lid; characters which seem to distinguish *Leskea* from *Isothecium*, as defined in the previous part of this work. The absence of cilia to the inner peristome, though a common feature of the group, is not a constant mark of the genus. We include *Leskea polyantha* Hedw., and its near exotic ally *Pterogonium intricatum* Hedw., instead of placing them in *Pylaisea* of Bridel, these two mosses having very little agreement in habit with Bridel's typical species *P. radicans*, and having, moreover, very little mutual resemblance in the structure and insertion of the peristome.

Most of the species of *Leskea*, as here given, are removed to other genera in *Bryol. Europ.*, and probably with good reason; but it is considered undesirable to increase the bulk of this treatise by the introduction of minute details from that admirable work.

A. Leaves without striæ.

a. Leaves nerveless.

* Leaves obtuse, roundish, concave.

327. 1. *Leskea moniliformis* Wahlenb. (*slender round-leaved Leskea*); stems slender, erect, sparingly branched; leaves closely imbricated, roundish-ovate, rather obtuse, concave, nerveless; capsule suberect, oval-oblong, tapering below; lid conical. (Tab. XXIV.)

Myurella julacea *Bryol. Eur.*
Hypnum moniliforme *Wahlenb.* Fl. Lap. *Hook. and Tayl.* tab. xxiv.
Isothecium julaceum *Bridel*, Bryol. Univ. ii. 365.
Hypnum julaceum *Vill.* *Schwaegr.* Suppl. t. 89. *Funck*, Deutsch. Moose, t. 39. f. 14. *Brid.* Meth.

Leskea julacea *Schwaegr. Web. and Mohr.* (not *Bridel*, Br. Univ.)
Pterogonium rotundifolium *Smith*, Eng. Bot. t. 2525.
Pterigynandrum fragile *Schleich.*

Hab. On alpine rocks; very rare in fruit. Ireland, *Mr. Mackay.* Ben Lawers, &c., Scotland. Ingleborough, Yorkshire, *John Nowell.* Fr. Summer.

Stems about ½ inch in height, densely tufted, very slender and filiform, brittle, especially when dry. Foliage pale glossy green, yellowish when old. Leaves very concave, almost round, obtuse, or very shortly pointed, the margin denticulate towards the base, very thin and membranous; areolæ roundish. Perichætial leaves ovate-lanceolate, erect, reddish. Fruitstalk ½ inch long or more, slender, reddish. Capsule reddish-brown, small, apophysate; the sporangium much shorter than the capsule itself. Annulus present. Peristome yellowish-brown; inner peristome white, cilia very short, often wanting. Lid short, conical. Calyptra dimidiate.

A very distinct, beautiful species; the fruit described from specimens in Drummond's *Musci Americani*, No. 220. Inflorescence probably dioicous.

Leskea julacea of Bridel, *Bryol. Univ.* ii. 304., found on the Swiss Alps, is exceedingly rare, and very little known: it differs from the above in the ovate-lanceolate leaves, striated perichætium, and irregular capsule.

** Leaves acute, ovate-lanceolate.

328. 2. *Leskea latebricola* Wilson (*lurking Leskea*); dioicous; stems slender, ascending, sparingly branched; leaves ovate-lanceolate, tapering, subsecund, entire, margin slightly reflexed, faintly two-nerved at the base; capsule elliptic-oblong, tapering below; lid conical. (Tab. LIV.)
Plagiothecium latebricola *Bryol. Eur.*
Leskea latebricola *Wilson MS.*

Hab. Moist shady woods, on decaying trunks of alder trees, and on old stocks of *Aspidium Filix-mas.* Paper-mill Wood, near Over, Cheshire, with fruit, Feb. 1828. Orford, near Warrington, &c., barren, *W. Wilson.* Near Henfield, Sussex, *Mr. Borrer.* Near Todmorden, Lancashire, *John Nowell.* Fr. Winter.

Growing in yellowish or bright green, shining tufts, usually in company with *Hypnum denticulatum.* Stems slender, about ¼ inch in height, succulent, rather brittle, somewhat radiculose at the base, sparingly branched, branches erect, slender. Leaves somewhat bifarious, but directed upwards to one side, succulent, ovate-lanceolate, tapering to an acute point, slightly concave, decurrent at the base, so as to render the stem somewhat winged; obsoletely two-nerved at the base; margin reflexed; areolæ narrow, elongated. Perichætial leaves ovate-lanceolate, erect. Fruitstalk ½ inch long. Capsule when dry almost turbinate, wide-mouthed. Annulus dehiscent. Outer teeth somewhat spreading and incurved when dry. Inner peristome without cilia, the membrane deeply divided into narrow, carinate processes. Lid short, acutely conical. Barren flowers on separate plants, either on the principal stem, or on the younger branches; small, gemmiform; antheridia few, without paraphyses.

A very small species, somewhat resembling *Hypnum pulchellum*; differing in the more succulent, tapering, decurrent leaves with reflexed margins; in the dioicous inflorescence; and in the regular, erect capsule. It is considerably smaller than *Hypnum denticulatum*, and is readily distinguished by the form of the leaves, and by the inflorescence. Our specimens of *Plagiothecium lætum* Bryol. Eur. scarcely differ from the smaller forms of *H. denticulatum*.

329. 3. *Leskea Sprucei* Bruch (*Mr. Spruce's Leskea*); dioicous; stems capillary, very minute and slender, sparingly branched; leaves distant, spreading, narrowly ovate-acuminate, almost entire, nerveless, reticulated; perichætial leaves attenuated and serrated at the apex; capsule erect, elliptical or turbinate; lid conical, apiculate. (TAB. LIV.)

Amblystegium Sprucei *Bryol. Eur.*
Leskea Sprucei *Bruch*, in lit.
Leskea tenella *Schimper MS.*
Hypnum confervoides *Drummond*, Musc. Americ. No. 190. (not of *Schwaegr.* Suppl. t. 142.)

Hab. On shady subalpine rocks; rare. Shady rocks below Winch Bridge, Teesdale, July, 1843, with fertile flowers only, *Mr. Spruce.* Dulesgate, Green's Clough, and Shedden Clough, near Todmorden, *John Nowell.* Fr. Spring?

An exceedingly delicate and minute moss; with slender, hair-like stems, which, with the very minute leaves, might easily be mistaken for a species of conferva. Branches scarcely $\frac{1}{3}$ inch in length. Leaves lax, distant, spreading, subsecund; smaller and more pellucid than those of the allied species *Leskea subtilis* Hedw., with larger areolæ, ovate-acuminate, or ovate-lanceolate, concave, nerveless, scarcely serrulate. Perichætial leaves larger, evidently serrated, ovate-lanceolate, with elongated slender points. Fruitstalk scarcely $\frac{1}{3}$ inch in length, reddish. Capsule when dry short, turbinate, widemouthed, constricted just below the mouth, reddish or purplish, erect. Peristome yellow. Inner peristome whitish, with or without short interposed cilia. Lid conical, acuminate, nearly as long as the dry capsule. Calyptra brownish, dimidiate.

Hypnum conferva of Schwaegr. differs from the above, according to the description, thus: — Leaves more crowded, opaque, appressed when dry, entire; areolæ smaller; perichætial leaves entire; inflorescence monoicous. *Leskea subtilis* Hedw. has monoicous inflorescence, paler capsules, and longer leaves; and is of greater size.

Leskea Sprucei, when in fruit, cannot well be confounded with any other British moss; but its diminutive size may have caused the barren plant to be often overlooked as a small state of *Hypnum serpens*.

Hypnum confervoides of Sullivant, *Musci Alleghanienses*, No. 31., appears to be a variety of this with secund leaves and inclined capsules. It appears to have been confounded with the true *H. conferva* of Schwaegr. in Gray's *Manual* of the Botany of the Northern United States.

330 4. *Leskea polyantha* Hedw. (*many-flowered Leskea*); stems creeping; branches crowded, simple, incurved at the apex; leaves subsecund, assurgent, ovate, much acuminated, nerveless, entire; capsule erect, oblong; peristome inserted below the orifice; lid conical, pointed. (Tab. XXXV.)

Pylaisea polyantha *Bryol Eur.*
Leskea polyantha *Hedw.* St. Crypt. iv. t. 2. *Schwaegr. Willd. Röhl. Funck,* Deutsch. Moose, t. 36. *Wahlenb. Swartz. P. Beauv., &c.*
Hypnum polyanthos *Schreb. Turner? Smith? Linn. Dill.* Musc. t. 42. f. 62.? *Wilson,* in Eng. Bot. Suppl. t. 2871. *Hooker and Taylor.*
Leskea filiformis *Sibth.*
Hypnum filiforme *Hudson.*

Hab. On trees. Near Darlington, *Mr. Backhouse.* Rocks and trees about Forfar, Scotland, *Mr. Drummond.* Anglesey and Derbyshire, *W. Wilson.* Near York, *Mr. Spruce.*
Fr. July, August.

Stems creeping, crowded; branches irregular, crowded, not ½ inch long, incurved above. Leaves crowded, all turned upwards, slightly spreading; ovate and concave below; with long, narrow, tapering points; entire, nerveless, or faintly two-nerved at the base. Perichætial leaves erect; not taper-pointed, but suddenly apiculate. Fruitstalk ½ inch long or more, reddish. Capsule oblong, rather wider below, or elliptic-oblong, reddish-brown. Annulus obscure. Outer peristome yellow, inserted considerably below the mouth of the capsule, incurved when dry; inner peristome longer than the outer teeth, with 16 broad sharply carinate processes, and very short interposed cilia. Calyptra brownish, dimidiate, as long as the capsule. Spores small, greenish. Inflorescence monoicous.

Pterogonium intricatum Hedw. (Drummond, *Musc. Am.* No. 75.) differs from this in the more elliptical, small-mouthed capsule, pale not immersed teeth, and adnate, obscure, inner peristome. *Hypnum resupinatum* differs in the rostrate lid, and in the structure of the peristome, which is that of a true *Hypnum.*

b. Leaves nerved, ovate.

331 5. *Leskea pulvinata* Wahlenb. (*green-cushioned Leskea*); stem procumbent; branches slender, ascending, crowded, fastigiate; leaves imbricated, spreading, ovate, concave, faintly nerved half-way, or two-nerved at the base; capsule elliptic-oblong, erect; lid conical, apiculate. (Tab. LIV.)

Leskea pulvinata *Wahlenb.* Fl. Lapp. 369. *Schwaegr. Bridel. Bryol. Eur.*
L. subenervis *Schwaegr.* Suppl. t. 85. *Funck,* Deutsch. Moose, t. 36. *Steudel. Bridel.*

Hab. At the roots of trees, in similar situations with the next species. Near York, 1841, *Mr. Spruce.* Near Chorlton, Lancashire, *Dr. Wood* and *Richard Buxton.* Fr. May, June.

Monoicous. Stems densely crowded, in deep green patches, about ½ inch in height; branches slender and level-topped, slightly curved. Leaves spreading, scarcely secund, of soft texture, elliptic-ovate, narrowed at the base, with rather large oval or hexagonal areolæ, intensely green, entire, subacute; the nerve short, simple, or forked; margin plane. Perichætial leaves erect, nerveless, pale, and membranous. Fruitstalk ⅓ inch, reddish, smooth. Capsule nearly or quite erect; more or less regularly oval-oblong, tapering below, of thin texture, pale reddish-brown; constricted below the mouth when dry. Annulus none. Outer teeth pale yellow; incurved when dry; inner peristome reddish-brown, fugacious, without interposed cilia, with a narrow basal membrane. Lid yellowish, fugacious. Calyptra whitish, small, dimidiate. Spores greenish; twice as large as in the next species.

A smaller and more slender species than *L. polycarpa*; distinguished at once by the colour of the foliage, by the faintly nerved leaves, and by the deeply coloured inner peristome. The capsules ripen at different intervals. *L. subenervis* of Schwaegrichen has somewhat narrower leaves; but agrees with our moss in all essential characters.

332 6. *Leskea polycarpa* Ehrh. (*many-fruited Leskea*); stems procumbent, pinnatedly or irregularly branched; branches ascending, slightly curved and thickened at the top; leaves imbricated, subsecund, ovate-acuminate, strongly nerved almost to the apex; margin reflexed; perichætial leaves striated; capsule erect, subcylindrical; lid conical. (Tab. XXIV.)

Leskea polycarpa *Ehrhart. Schrader. Hedw.* Sp. Musc. *Funck*, Deutsch. Moose, t. 35. f. 4. *Schwaegr. Web. and Mohr*, Bryol. Eur.

Hypnum medium *Dickson*, Crypt. Fasc. 2. p. 12. *Turner. Smith*, Eng. Bot. t. 1274. (fig. not good.) *Hook. and Tayl.*

Hypnum inundatum *Dicks. Turner* (fide *Smith*). *Smith*, Eng. Bot. t. 1922. (figure good.) *Dill.* Musc. t. 37. f. 27. B. (figured from a barren specimen) t. 42. f. 65. (partly).

var. β. paludosa; branches erect; leaves lax, distant, lurid-green, widely spreading; capsule elongated.

Leskea paludosa *Hedw.* St. Crypt. iv. t. 1. *Bridel. Web. and Mohr. Funck*, Deutsch. Moose, t. 35.

Hypnum paludosum *Linn.*

Hab. At the roots of trees; usually near rivers, or in places liable to be inundated; var. β. in more moist shady situations.

Fr. May, June.

Monoicous. Growing in more or less compact yellowish or lurid green patches. A more robust species than the last, with a greater disposition to a pinnate division of the branches, which are thickened at the extremity. Leaves tapering above, with smaller areolæ, and of firmer texture, subpapillose at the back; the stout nerve continued almost to the apex; margin reflexed in the lower part, entire. Perichætial leaves distinctly striated, erect, nerved. Fruitstalk ½ inch long. Capsule subcylindrical, reddish. Annulus small. Outer teeth pale, almost white, spreading when wet; in a dry state incurved in the upper half, reflexed below, so as to be "staple-bent;" inner peristome buff-coloured, with traces of interposed cilia. Spores small, yellowish. Lid conical, more or less acute, yellowish, or orange. Calyptra brownish, dimidiate.

Hypnum medium and *H. inundatum* of *Turn. Musc. Hib.* cannot, we are persuaded, be considered as distinct species; and would not have been published as such, had the figure of *H. inundatum* of *Eng. Bot.* t. 1922. been then extant; for that is the only one in that work which gives a faithful representation of the usual state of the species, and is certainly not what Hedwig or Bridel would have regarded as the same form as that which they give as *Leskea paludosa.* Bridel, indeed, contends that *L. paludosa* is distinct from *L. polycarpa;* but his opinion seems to be founded on a misapprehension of what is said by Dillenius, who has evidently confounded *Hypnum palustre* Linn. with this species, concerning which he remarks, that "when growing in drier situations it is of a lighter green colour, with leaves less reflexed and more rigid, and the stem more branched." The species appears to have been very imperfectly understood by him; for he appears to have confounded it a second time with *Pterogonium intricatum* Hedw. (see remarks of Hooker and Arnott in *Journ. Bot.* 1834). The var. β., which occurs in marshy situations near Warrington, is less frequent; and is altogether dependent on local influences for its deviation from the typical form.

B. Leaves striated.

333 7. *Leskea sericea* Dill., Linn. (*silky Leskea*); stems creeping, branched; branches crowded, erect, slightly curved; leaves imbricated, erecto-patent, lanceolate-acuminate, plicate, nerve vanishing below the apex; fruitstalk muriculate; capsule erect, subcylindrical; lid conical, shortly rostellate. (TAB. XXV.)

Homalothecium sericeum *Bryol. Eur.*
Leskea sericea *Hedw.* St. Crypt. iv. t. 17. *Schwaegr. Web. and Mohr. Funck,* Deutsch. Moose, t. 36. f. 12. *Bridel, Dill.* Musc. t. 42. f. 59.
Hypnum sericeum *Linn. Turner. Smith,* Eng. Bot. t. 1445. *Hook. and Tayl.*

Hab. On trunks of trees, walls and rocks. Fr. Nov.—March.

Dioicous. Growing in silky, yellowish-green patches. Stem creeping extensively; branches about $\frac{1}{2}$ inch in length, crowded, erect, somewhat incurved. Leaves occasionally subsecund, erecto-patent, crowded, scarcely serrulate at the apex; areolæ very narrow. Perichætial leaves erect, much attenuated, almost hair-pointed. Fruitstalk very rough, reddish. Capsule ovate-cylindrical, narrower upwards, erect, symmetrical. Annulus small, subpersistent. Outer teeth reddish, trabeculate at the back, and also internally; inner peristome yellow, fragile, its narrow processes adhering to the outer teeth, and soon ruptured; cilia none. Lid conical, shortly and obliquely rostellate. Calyptra yellowish, rather large, sometimes slightly hairy, dimidiate.

Except as to the erect, symmetrical capsule, and the absence of cilia to the inner peristome, this moss has much affinity with *Hypnum lutescens*.

Isothecium Philippeanum Spruce (*Homalothecium* Bryol. Eur.), from the Pyrenees, nearly allied to the above, has the stem taller and more branched, the nerve of the leaf longer, and the fruitstalk smooth. *Hypnum Nuttallii* Wils. MSS., from the west coast of N. America (Menzies, No. 53.), with smaller, less plicated leaves, and cernuous capsules, resembles this; but is more closely allied to ***H. aureum*** Lagasc.

334. 8. *Leskea rufescens* Hall., Smith (*reddish Leskea*); stems erect, tufted, branched; branches erect, slightly compressed; leaves imbricated, erecto-patent, lanceolate, acuminate, plicate, nerveless; capsule erect, oblong; lid conical-acuminate. (Tab. XXV.)

Orthothecium rufescens *Bryol. Eur.*
Leskea rufescens *Schwaegr.* Suppl. t. 86. *Funck,* Deutsch. Moose, t. 36. f. 13. *Greville,* in Wern. Trans. *Bridel.*
Hypnum rufescens *Dickson,* Crypt. Fasc. 3. t. 8. f. 4. *Smith,* Eng. Bot. t. 2296. *Hook and Tayl.*

Hab. On moist shady rocks, in mountainous situations. Scotch Alps, not rare, but uncommon in fruit. Fr. Oct.

Dioicous. Stems growing in purplish or reddish, shining tufts, 3 inches or more in height, sparingly branched; branches erect, rather fragile. Leaves nearly erect, entire, nerveless, plicated; more or less acuminated; sometimes almost hair-pointed. Perichætial leaves small, reddish-brown, smooth, ovate, narrowly acuminated. Fruitstalk smooth, reddish, 1 or 2 inches long. Capsule oblong or subcylindrical; either quite erect and symmetrical, or slightly curved and inclined. Annulus small. Outer teeth yellowish-brown, small; inner peristome white; usually destitute of cilia; rarely with short solitary cilia between the processes. Lid conical, short. Barren flowers small, gemmiform, compressed.

Bridel (in *Bryol. Univ.*) remarks that *Leskea rufescens*, in a natural method, is a *Hypnum*, and should stand in juxtaposition with *Hypnum nitens;* but the capsule, though sometimes curved, appears to be usually erect and symmetrical, and the cilia of the inner peristome are very rare. *Hypnum chryseon* Schwaegrichen, in Drummond's *Musci Americani*, No. 221., agreeing perfectly with authentic examples of *Hypnum chryseon* from Dr. Hornschuch, has the leaves shorter and less acuminate than in the ordinary form of *Leskea rufescens*, and of a paler colour; and may be a distinct species.

335. 9. *Leskea subrufa* Wilson (*fine-leaved Leskea*); dioicous; stems slender, cæspitose, branched; branches erect; leaves lanceolate-acuminate, erecto-patent, subsecund, nerveless, entire, substriated when dry; capsule suberect, ovate-oblong; lid conical-acuminate. (Tab. LIV.)

Orthothecium intricatum *Bryol. Europ.*
Leskea subrufa *Wilson MS.*
Isothecium homomallum *Spruce MS.*

Isothecium chryseum *Spruce,* in Ann. Nat. Hist. vol. 3. p. 147.

Hab. Subalpine rocks, not unfrequent, but always barren: generally overlooked as a diminutive state of *L. rufescens.*
Fr. Summer.

A smaller and more delicate species than the last; growing in more compact tufts, of which the younger foliage is green, and the rest pale reddish or purplish-brown. Branches slender, slightly fasciculate. Leaves subsecund, tapering from the base, very acute, entire, nerveless. Perichætial leaves reddish-brown, attenuated above. Seta 1 inch long. The fruit is exceedingly rare; but has been found in Norway and in a few other places. (v. *Bryol. Europ.*)

This moss bears some resemblance to *Hypnum resupinatum;* but in that the leaves are less tapering, not striated when dry; and the colour of the old foliage is quite different; as well as the areolation at the base of the leaf.

Authentic specimens of *Leskea chrysea* (*Hypnum chryseon* Schwaegr.), in the Hookerian Herbarium, fully justify us in the opinion that the moss now before us is quite different. Bridel's description of *Leskea rufescens β. chrysea* (in *Bryol. Univ.* ii. p. 286.) is vague, but not opposed to this view. He may have confounded these two mosses, as others have done, since he wrote.

SUBORDER XXXII. HYPNEÆ.

83. HYPNUM *Dill., Hedw.* Feather-Moss.

HYPNUM and STEREODON *Bridel.*

A very extensive genus of pleurocarpous mosses, with cernuous, curved capsules, on long fruitstalks; double peristome, and dimidiate calyptra; varying much, as in *Dicranum*, in size, habit, mode of vegetation, and in the position of the flowers; but the different groups or sections so connected by intermediate forms, that a subdivision of the series into several genera is scarcely practicable. In this work we have removed some species which were included in this genus in the *Muscologia Britannica;* and have placed them partly in *Leskea,* and partly in *Isothecium;* concurring with Bruch and Schimper in the removal of *Climacium dendroides.* The species are all perennial; and grow in almost every kind of locality.

Stems mostly creeping and cæspitose, pinnatedly or irregularly branched; *branches* erect, spreading or horizontal.

Leaves variable according to the species, mostly ovate or ovate-lanceolate, more or less acuminate, concave, entire or serrated; *margin* reflexed or plane; *texture* more or less membranous, but firm; nerved or nerveless; the *nerve* varying in length according to the species; *areolæ* mostly narrow and elongated (prosenchymatous); sometimes roundish or dot-like.

Inflorescence dioicous, monoicous, or polygamous. *Barren* *flowers* gemmiform, ovate, axillary, either on the stem or on the branches; sometimes (as in *H. strigosum*, *recurvans*, *lutescens*, and *micranthum* Wils. MSS.) dubiously attached to the fertile stems by means of radical fibres only; presenting some analogy to those of *Dicranum majus* and the allied species with quasi-monoicous inflorescence: *antheridia* oblong, pedicellate, mixed with filiform paraphyses. *Fertile flower* narrower, longer, and less turgid than the barren flower; inserted usually on the stem, seldom on the branches; *archegonia* with styles of moderate length; mostly accompanied by paraphyses of greater length; the floral envelope subsequently enlarged, and appearing in the form of perichætial leaves.

Capsule cernuous; rarely pendulous; sometimes nearly erect; more or less curved or irregular; ovate or oblong; somewhat tapering at the base, and occasionally slightly apophysate; the sporangium usually contiguous to its internal cavity. *Annulus* mostly large and elastically dehiscent; sometimes small and persistent. *Lid* conical; or more or less obliquely rostrate from a hemispherical base. *Calyptra* cucullate, pale, and membranous; rather small. *Peristome* double; *outer peristome* as in *Bryum*, hygrometric, spreading when first exposed to the air, at length somewhat incurved; the *teeth* 16, equidistant, lanceolate-acuminate, trabeculated on the inner side, formed of two differently coloured series of cellules, as in *Bryum*; reddish-brown, or yellowish: *inner peristome* a membrane divided half-way down into 16 carinate, often perforated, processes, alternating with the outer teeth; with intermediate cilia, which are either solitary or two or three together. *Spores* mostly small, reddish-brown or yellow.

This genus (named from *υπνος*, *sleep*) differs from the allied genus *Leskea* in the cernuous capsule, and in the presence of cilia to the inner peristome: it is still more nearly allied to *Isothecium*; which differs from *Hypnum* in the dendroid habit, and usually erect, symmetrical capsules. Some of the species of *Hypnum*, especially those with dioicous inflorescence, are very rare in fruit. They ripen their capsules for the most part in the winter months, or in early spring.

Bridel's genus *Stereodon* does not appear to differ essentially from *Hypnum*: the only character assigned is the want of perforations in the processes of the inner peristome; and this seems to depend on the smaller size of the species; and is moreover inconstant.

The arrangement of the genus, here given, was prepared years ago; and it is very satisfactory to find, on revision, that it differs very little, in essential points, from that recently published in *Bryologia Europæa*. As that portion of the work is only partially published, we think it best to present our own views unaltered. The genera into which the *Hypna* are subdivided, in the excellent work to which we have alluded, are mentioned in the synonyms of this work, under each species.

SECT. I. *Leaves more or less spreading, every way.*

A. Stem creeping, irregularly branched; or occasionally arched and pinnate.

* Leaves acute; nerved half-way or more.

† Leaves plicate. *Plumosa.*

336 1. *Hypnum nitens* Dill., Schreb. (*shining Feather-Moss*); stems erect, slightly pinnate; branches short, acute, spreading; leaves imbricated, erecto-patent, lanceolate-acuminate, striated, nerve ceasing below the apex; capsule cernuous, oblong, arcuate, lid conical. (TAB. XXV.)

Hypnum nitens *Schreb. Hedw. Smith*, Eng. Bot. t. 1646. *Schwaegr. Funck*, Deutsch. Moose, t. 40. f. 21. *Hook. and Tayl.*

H. Stereodon nitens *Bridel. Dill.* Musc. t. 39. f. 37.

Hab. Bogs in Scotland, *Mr. Dickson.* Pentland Hills, *Maughan.* Kinross-shire, *Dr. Arnott.* Near Acle, Norfolk, *Mr. Turner.* Marshy ground between Copgrove and the river Ure, Yorkshire, *Rev. James Dalton.* Knutsford Moor, Cheshire, *W. Wilson.* Terrington Car, Yorkshire, *Mr. Spruce.*

Fr. April, May.

Dioicous. Stems growing in yellowish-green, silky patches, 2 inches or more in height; beset with purplish-brown radicles, pinnatedly branched; except when too much crowded; branches short and cuspidate. Leaves entire, tapering, and very acute; plicate, with recurved margin, shining yellowish-green; areolæ narrow. Perichætial leaves erect, striated. Fruitstalk smooth, an inch long or more. Capsule arcuate, cernuous, reddish-brown. An elegant species; rarely found in fruit.

37- 2. *Hypnum albicans* Dill., Neck. (*whitish Feather-Moss*); stems erect, sparingly and irregularly branched; leaves closely imbricated, ovate-lanceolate, or ovate-acuminate, striated, entire, nerved above half-way; capsule ovate, cernuous; lid conical. (TAB. XXV.)

Brachythecium albicans *Bryol. Eur.*

Hypnum albicans *Neck. Hedw.* St. Crypt. iv. t. 5. *Turner. Smith*, Eng. Bot. t. 1300. *Funck*, Deutsch. Moose, t. 39. f. 11. *Schwaegr. Web. and Mohr. Bridel. Hook. and Tayl. Dill.* Musc. t. 42. f. 63.

Hab. In sandy places, amongst grass; not common in fruit.

Fr. Nov., Dec.

Dioicous. Stems slender, cæspitose; foliage pale green. Leaves ovate below, much acuminated and taper-pointed, entire; appressed when dry, slightly spreading when moist; concave, less distinctly striated than in the preceding species. Fruitstalk smooth, slender. Capsule shortly ovate, small, cernuous, very little bent. It is distinguished from the allied species by its slender, delicate habit; and by the pale green, membranous leaves.

338 3. *Hypnum glareosum* Bruch (*larger streaky Feather-Moss*); dioicous; stem procumbent, subpinnate, branches acute; leaves ovate-acuminate, with very long slender points, plicate, nerved above half-way, subserrulate at the apex; fruitstalk smooth; capsule ovate-oblong, cernuous, arcuate; lid conical, acuminate. (Tab. XXXV. LV.)

Brachythecium glareosum *Bryol. Eur.*
Hypnum plumosum *Hedw.* St. Crypt. iv. t. 15. (partly?)
Hypnum salebrosum *Hook. and Tayl.* (not *Hoffm.*)
H. albicans var. minnidunense *Bridel,* Br. Univ.

Hab. On grassy shady banks, and in woods. Cotteral Wood, near Manchester, *Mr. Hobson.* Stockton Forest, near York, *Mr. Spruce.* Sussex, *Mr. Mitten.* Seldom in fruit. Fr. Nov.

Stems 2 inches long or more, procumbent, pinnatedly or sometimes irregularly branched. Leaves crowded, erecto-patent, yellowish, or full green; much attenuated and almost piliferous at the extremity, which is often slightly twisted; margin reflexed below; areolæ narrow. Perichætial leaves subsquarrose, nerveless, piliferous. Fruitstalk about an inch long, reddish, smooth. Capsule longer and more cernuous than in the preceding, reddish-brown.

Distinguished from *H. salebrosum* Hoffm. by the long, slender, twisted points of the leaves, and by the dioicous inflorescence.

339. 4. *Hypnum salebrosum* Hoffm. (*smooth-stalked streaky Feather-Moss*); monoicous; stem procumbent, subpinnate; leaves ovate-acuminate, subserrulate, striated, nerved above half-way; fruitstalk smooth; capsule shortly ovate, cernuous; lid conical. (Tab. LV.)

Brachythecium salebrosum *Bryol Eur.*
Hypnum salebrosum *Hoffm.* Deutsch. Fl. 2. p. 74. *Web. and Mohr. Schwaegr. Funck,* Deutsch. Moose, t. 42. f. 31. *Bridel.*
H. plumosum *Hedw.* St. Crypt. iv. t. 15. (partly); Sp. Musc. p. 257.

Hab. On grassy sandy banks, and trunks of trees. Near the Loch of Forfar, *Mr. Drummond* (Musc. Scot. n. 168.). Near Castle Howard, Yorkshire, *Mr. Spruce.* Sussex, *Mr. Mitten.* Fr. Nov.

Distinguished from the last by the monoicous inflorescence; and by the shorter, less tapering leaves, which are more evidently serrulate, of firmer texture, and more indistinctly striated. Fruitstalk about ½ inch long, smooth.

Hypnum campestre of Bruch is nearly allied, but has the capsule oval-oblong or subcylindrical, and the fruitstalk roughish. It has not yet been found in Britain.

340. 5. *Hypnum lutescens* Dill., Huds. (*rough-stalked yellow Feather-Moss*); monoicous; stem suberect, irregularly branched, or subpinnate; branches erect or spreading; leaves loosely im-

bricated, erecto-patent, ovate-lanceolate, acuminate, striated, entire, nerve ceasing below the apex; fruitstalk rough; capsule oblong, cernuous, arcuate; lid conico-rostellate. (TAB. XXV.)

Camptothecium lutescens *Bryol. Eur.*
Hypnum lutescens *Huds.* Fl. Angl. ed. 1. p. 421. *Hedw.* St. Crypt. iv. t. 16. *Turner. Smith,* Eng. Bot. t. 1361. *Funck,* Deutsch. Moose, t. 42. f. 32. *Schwaegr. Hook. and Tayl. Bridel. Dill.* Musc. t. 42. f. 60.
H. Cassubicum *Scop.* (not of *Dickson*).

Hab. On limestone rocks; sandy banks, especially near the sea. Fr. April.

Growing in rather loose, yellowish-green, or fulvous patches. Stems ascending or decumbent; about 3 inches or more in height; copiously branched, sometimes pinnate; branches elongated. Leaves narrower and more lanceolate than in the preceding species, more rigid, more evidently striated, or plicato-striate, with a longer nerve. Fruitstalk rough; by which character and by the rostellate lid this species is readily distinguished from its allies. The inflorescence is seemingly monoicous, having very small, nidulant, barren flowers loosely inserted on the surface of the leaves, or in the axillæ.

Hypnum aureum of Lagasca differs in the creeping, pinnated stem, with short incurved branches, like those of *Leskea sericea;* and in the short conical lid. *H. Nuttallii* Wils. MS., from the west coast of N. America, differs from both in the regularly dioicous inflorescence. All three are referred to the new genus *Camptothecium* in *Bryol. Europ.*

41. 6. *Hypnum plicatum* Schleicher, Web. and Mohr (*plaited Feather-Moss*); dioicous; stem creeping, or procumbent, irregularly branched; branches ascending, elongated, incurved; leaves imbricated, subsecund, ovate-acuminate, plicate, nerved almost to the apex, margin recurved; capsule ovate-oblong, cernuous. (TAB. LV.)

Brachythecium plicatum *Bryol. Eur.*
Hypnum plicatum *Web. and Mohr,* Bot. Tasch. p. 364. *Schwaegr. Bridel.*

Hab. Alpine rocks. Rocks near the summit of Ben Lawers, in shady crevices, beside *H. Halleri*; May, 1841; *Mr. Lyon.* Fr. April?

Stems mostly creeping, with distant, curved, elongated, upright branches; tomentous, with short villi, as in *H. abietinum.* Leaves ovate, much acuminated, or tapering, more or less secund, plicate, yellowish, somewhat glossy, almost appressed when dry; areolæ narrow, elongated. Perichætial leaves twice as large, smooth, erect; slightly recurved at the apex; faintly nerved half-way, pale and glossy. Fruitstalk scarcely ½ inch long, slender, smooth, red. Capsule small, narrowly elliptical, dull reddish-brown. Lid supposed to be conical; absent in our specimens from the Jura mountains: those from Ben Lawers are without fruit. Calyptra yellowish. Inflorescence dioicous.

Somewhat larger than *H. lutescens,* and the leaves wider, more rigid, with a stronger nerve; more evidently plicate, subsecund. In general aspect it is intermediate between *H. lutescens* and *H. atro-*

virens. The tomentous stem shows an affinity with *H. abietinum;* but the stems are creeping and irregularly branched, not pinnate; and for the same reason cannot well be confounded with *H. rugosum*, to which some authors have supposed it to be nearly allied. In *Bryol. Europ.* the inner peristome is said to want cilia.

†† Leaves substriated, or smooth, mostly serrated.

a. Fruitstalk rough. *Scabriseta.*

‡ Lid conical, or rostellate.

§ 1. *Velutina.*

342. 7. *Hypnum plumosum* Swartz, Schwaegr. (*rusty Feather-Moss*); stem creeping, subpinnate; leaves erecto-patent, subsecund, ovate-acuminate, concave, subserrulate, nerved above half-way; fruitstalk roughish; capsule cernuous, roundish-ovate; lid conical, very acute. (TAB. XXV.)

Brachythecium plumosum *Bryol. Eur.*
Hypnum plumosum *Swartz*, Musc. Suec. p. 66. *Schwaegr.* Suppl. t. 225. b. (omitting the synonym of *Swartz*). *Turner*, Musc. Hib. p. 172. t. 15. f. 1.? *Smith*, Fl. Brit.? Eng. Bot. t. 2071. (figure not good) *Funck*, Deutsch. Moose, t. 43. f. 38. *Dill.* Musc. t. 35. f. 16.?
H. pseudoplumosum *Bridel*, Bryol. Univ. ii. 472.
H. rutabulum var. δ. *Turner*, Musc. Hib.
H. alpinum *Smith*, Eng. Bot. t. 1496. *Turner.*
H. flagellare *Hedw.* Sp. Musc. t. 73. f. 1—3. (not of *Dickson*).
H. aquaticum *Funck*, Deutsch. Moose, t. 44.
H. chrysostomum *Richard*, Fl. Amer. Bor. *Michaux*, ii. p. 319.! *Schwaegr.*
H. salebrosum *Mougeot and Nestler*, Crypt. n. 428.

Hab. On shady rocks, and on stones in rivulets, walls, &c., chiefly in subalpine districts. Fr. Oct., March.

Inflorescence monoicous. Stems sometimes creeping and pinnate, as represented in the figure given by Dillenius; more commonly with erect branches, which are more or less elongated. Leaves narrowly ovate, shortly acuminated, concave, of rather firm texture, subserrulate at the apex, generally subsecund; the nerve reaching above half-way. Fruitstalk roughish in the upper part, about ½ inch long or more, reddish. Capsule roundish-ovate, rather small, with a very acute conical lid, as in *H. populeum.*

In more alpine situations the branches are elongated, and the leaves more evidently secund. In this state it is *H. alpinum* of Smith and Turner.

Very much confusion exists in the earlier works on Bryology concerning this species; and Swartz himself appears to have given two very different mosses, under the name of *Leskea plumosa*, to Weber and Mohr, and to Schwaegrichen, who do not cite *Hypnum plumosum* Swartz. It is highly probable that the Swartzian specimen, figured by Schwaegrichen as *Hypnum plumosum*, was sent by mistake under the name of *Leskea*, instead of *Hypnum plumosum*. The other Swartzian specimen (unique), sent to Weber and Mohr under the name of *Leskea plumosa*, appears to be *Hypnum resupinatum* of this work (*H. multiflorum* Tayl. in *Flora Hibern.* ed. 2.), and not a variety of *H. incurvatum*, as Bridel supposed. Turner (in *Musc. Hib.*) affirms that *H. plumosum* of that work exactly corresponds with specimens so named from Schrader; but we are informed by Weber and Mohr that Schrader distributed under that name *Hypnum populeum*, and also *H. velutinum;* and the specimen of *H. plumosum*, sent by Mohr to Turner, is admitted to be quite different from that of Schrader: hence it is probable that *H. plumosum* of Turner (*Musc. Hib.*) is *H. populeum*, and not specifically different from *H. inflexum* of the same work. This moss was sent by Dickson to Hedwig in mistake, instead of the true *H. flagellare;* as stated in *English Botany*, under *Hypnum alpinum*. *Hypnum plumosum* of Hedwig is not the moss of Dillenius, nor of Linnæus, who describes his species "antheris erectis," as they are represented in *Dill. Musc.* t. 35. f. 16. Hedwig's moss, therefore, requires a different name; and is probably identical as to the figure, and partly as to the description, with *H. glareosum* of Bruch; but has commonly been referred to *H. salebrosum* of Hoffmann.

43. 8. *Hypnum populeum* Swartz? Hedw. (*matted Feather-Moss*); stem creeping, subpinnate; leaves erecto-patent, ovate-lanceolate, acuminate, subserrulate, nerved to the apex, margin reflexed; fruitstalk roughish; capsule roundish, ovate, subcernuous; lid conical, very acute. (TAB. XXIV.)

Brachythecium populeum *Bryol. Eur.*

Hypnum populeum *Swartz*, Musc. Suec. p. 66. (according to *Bridel*, not according to *Schwaegrichen*). *Hedwig*, Sp. Musc. t. 70. (described and figured from Swartzian specimens sent under the name of *H. populeum*). *Smith? Turner*, Musc. Hib. p. 172. t. 15. f. 1.? *Web. and Mohr. Funck*, Deutsch. Moose, t. 42. f. 33. *Schwaegr. Bridel. Hook. and Tayl.*

Hypnum implexum *Swartz. Turner*, Musc. Hib. p. 173. t. 16. *Smith*, Eng. Bot. t. 1584. *Dill.* Musc. t. 35. f. 16.?

Hypnum petrophilum *Funck*, Deutsch. Moose, t. 45. f. 46.

Hypnum saxicola *Sturm.*

var. β. nutans Brid.; capsule more evidently cernuous; branches more elongated.

Hab. On walls, rocks, and trees; frequent. Fr. Nov., Feb.

Monoicous. Stems creeping, subpinnate, with narrow, silky foliage, somewhat approaching in aspect to *Leskea sericea*. Leaves narrower than in the next species; nerved to the apex. Fruitstalk about ½ inch long, roughish. Capsule roundish-ovate, small, often suberect, and always less cernuous than in the next species, with a very acute conical lid, which remains long after the ripening of the capsule, the annulus being very small and persistent.

The figure in the work of Dillenius seems to belong to this moss, rather than to *Hypnum plumosum*, in consequence of the erect, roundish capsules; and indeed the description suits this species in many particulars.

344. 9. *Hypnum reflexum* Seliger, Starke (*reflexed Feather-Moss*); stem procumbent, arched and rooting at the extremity, subpinnate; branches slender, incurved, crowded; leaves loosely imbricated, widely ovate-acuminate, serrated, nerved to the apex; fruitstalk roughish; capsule roundish-ovate, horizontally cernuous; lid conical, acuminate. (TAB. XXIV.)

Brachythecium reflexum *Bryol. Eur.*

Hypnum reflexum *Starke*, in *Weber and Mohr*, Bot. Tasch. p. 306. 476. *Schwaegr.* Suppl. t. 143. (fig. good). *Funck*, Deutsch. Moose, t. 46. f. 55. *Hook. and Tayl.*

Hab. On Ben Nevis, near the base of the mountain. Craig-nagour, Ben Lawers, under large stones, *Dr. Arnott.* Usually found (on the Continent) on the trunks or at the roots of trees in subalpine situations. Clova mountains, July, 1807, *G. Donn* (in *Herb. Smith*, named *H. nigroviride*). Herefordshire, found by *Mr. Dickson*, according to a specimen from *Mr. Eagle*, in *Herb. Turner*, named *H. populeum.*

Fr. Spring.

Monoicous. Stems more slender, with more slender branches than in the preceding; always more or less arched, and rooting at the extremity. Leaves cordate-ovate, acuminate, erecto-patent, rather distant; erect when dry, with the points only reflexed; distinctly serrulate at the apex; nerve reaching nearly or quite to the top; areolæ rather large; margin reflexed. Fruitstalk scarcely ½ inch long. Capsule very short, small, roundish, horizontal. Lid above half as long, conical-acuminate.

This is readily distinguished from *H. populeum* and from *H. velutinum* by the slender, arcuate stem and branches, short, ovate leaves, and roundish, horizontal capsules.

Hypnum Starkii Web. and Mohr, not found in Britain, is very nearly allied to *H. reflexum.* It differs thus:—Twice or thrice as large. Leaves scariose; spreading, and substriated when dry, larger, deltoid-ovate; wider, and more cordate at the base; gradually tapering upwards; serrated to the base. Fruitstalk longer, thicker, and more evidently scabrous. Capsule larger, very short; suddenly bent at its junction with the fruitstalk, so as to resemble that of *Catoscopium nigritum*, and of *H. vagans* Hook. in Drummond, *Musc. Americ.* No. 189. *Leskea laxifolia* and *Hypnum crispifolium* Hook. *Musc. Exot.* are also nearly allied.

346. 10. *Hypnum velutinum* Dill., Linn. (*velvet Feather-Moss*); stems creeping; branches crowded, erect; leaves spreading, subsecund, ovate-lanceolate, acuminate, serrulate at the apex, nerved above half-way; fruitstalk rough; capsule ovate, cernuous; lid conical, apiculate. (TAB. XXVI.)

Brachythecium velutinum *Bryol. Eur.*

Hypnum velutinum *Hedw.* St. Crypt. iv. t. 70. *Turner.* *Smith*, Eng. Bot. t. 1568. *Schwaegr.* *Web. and Mohr.*

Funck, Deutsch. Moose, t. 44. *Bridel. Hook. and Tayl. Linn.* Sp. Pl. *Dill.* Musc. t. 42. f. 61.
Hypnum intricatum *Hedw.* St. Crypt. iv. t. 28.? *Funck*, Deutsch. Moose, t. 44. f. 45. *Schwaegr. Turner. Smith*, Eng. Bot. t. 2421.

Hab. On walls, sandy hedge-banks, and at the roots of trees: common. Fr. Nov., Dec.

Monoicous. Growing in compact, dull green patches; branches crowded, short, rather slender, erect or decumbent. Leaves ovate-lanceolate, taper-pointed, subsecund, more or less crowded and spreading; serrulate at the apex; margin recurved towards the base; nerve ceasing about half-way. Perichætial leaves attenuated at the apex, almost piliferous, mostly reflexed. Fruitstalk ½ inch or 1 inch long, rough. Capsule ovate or roundish-ovate, cernuous. Annulus large, deciduous. Lid conical; less acute than in *H. populeum.*

Of this species Bridel enumerates two varieties: var. β. *sericeum* Funck, with narrower, silky, yellowish-green foliage, and wider, sub-erect capsules; and var. γ. *intricatum*, half the size of the typical form, with narrower, distant leaves, longer nerve, and roundish capsules. He distinguishes this from *H. intricatum* of Hedwig, which is retained as a species, having the leaves narrowly lanceolate-acuminate, distant, more evidently serrated from the very base. Perichætial leaves erect, and not hair-pointed. Capsule ovate-ventricose, contracted at the mouth, and the annulus simple. We have received specimens from Mr. Thwaites, gathered near Bristol, of a very lax variety of *H. velutinum*, in which the leaves are distant, narrow, and more evidently secund; and the capsules roundish. This may be Hedwig's *H. intricatum;* but if so, we are unable to distinguish it as a species from *H. velutinum;* and it seems to owe its characters to the shady, damp locality in which it grows. Funck's specimens of *H. intricatum* do not differ in any respect from the common state of *H. velutinum*, found on sandy hedge-banks; but his *H. sericeum* (*Brachythecium trachypodium* Bryol. Eur.), with larger, shining, yellowish-green foliage, is probably distinct. The figures in *Eng. Bot.* (*H. velutinum* and *H. intricatum*) are not very characteristic of the species; nor yet of the respective forms; and are somewhat at variance with the figures and descriptions both of Hedwig and of Turner. The leaf of *H. velutinum* in *Eng. Bot.* is shorter and less acuminated than in any of our specimens.

Hypnum velutinum differs from *H. rutabulum* in its smaller size; more creeping habit; short, crowded branches; narrow, taper-pointed, secund leaves; and small, short capsules. The lid in this species soon falls away; the annulus being large, and elastically deciduous.

Hypnum velutinoides Bruch resembles *H. velutinum* in size and foliage; but has a rostrate lid and dioicous inflorescence; and is allied to *H. prælongum.*

§ 2. *Illecebra.*

rb. 11. *Hypnum illecebrum* Linn., Schwaegr. (*alluring Feather-Moss*); stem procumbent, irregularly branched, or subpinnate; branches incurved, obtuse; leaves closely imbricated, roundish-ovate, apiculate, very concave, serrulate, nerve ceasing below the apex; fruitstalk rough; capsule ovate-oblong, cernuous; lid conical, apiculate. (Tab. XXXV.)

Scleropodium illecebrum *Bryol. Eur.*
Hypnum illecebrum *Linn.* Sp. Pl. *Schwaegr.* Suppl. i. 2. p. 225. *Smith*, Fl. Brit. (partly), Eng. Bot. t. 2189. fig. 1. *Bridel*, Bryol. Univ.
Hypnum Touretii *Bridel*, Mant. Musc. (according to *Schwaegrichen* and *Bridel*).
Hypnum blandum *Hooker*, in Flora Londin. New Series (with a figure). *Dill.* Musc. t. 40. f. 16. C. (partly). *Hook. and Tayl.* *Wilson*, in Suppl. Eng. Bot. t. 2715.

Hab. On banks, and on rocks thinly covered with soil, especially near the sea. On a bank in Cadnam Lane, New Forest, Hampshire, *C. Lyell, Esq.* Holyhead Island, and in various places near Aberffraw, Anglesey, *W. Wilson.*
Fr. Nov., Dec.

Dioicous; growing in rather dense, bright green patches; branches bending downwards, about 1 inch long, cylindrical. Leaves shining, imbricated, erecto-patent, membranous, very concave, with a short slightly recurved point; minutely serrulated, not striated; margin not reflexed; the narrow nerve continued far beyond the middle, its summit slightly projecting from the back of the leaf, like the arista of grasses. Perichætial leaves erect, ovate-lanceolate. Fruitstalk 1 inch long, rough. Capsule ovate-oblong, slightly ventricose, cernuous; suddenly bent at its junction with the fruitstalk as in *H. purum.* Lid conical; bluntish, with a small point; or occasionally subrostellate.

This moss has sometimes been confounded with small states of *Hypnum purum;* from which it is distinguished by the rough fruitstalk and curved branches. *Eng. Bot.* t. 2189. fig. 2., and Mr. Teesdale's specimen in *Herb. Turner*, belong to *H. purum.* The Pennsylvanian moss mentioned by Dillenius, as identical with t. 40. f. 46. c., is *Hypnum Boscii* Schwaegr. (*H. illecebrum* Hedw. *Sp. Musc.* t. 66.); distinguished by its more robust habit, smooth fruitstalk, and rostrate lid.

Hypnum illecebrum seldom bears fruit in Britain: it grows to a larger size in Sicily and in Sardinia, where it appears to be plentiful.

Hypnum Touretii, according to Bridel (in *Bryol. Univ.* ii. 429.) is a variety β., with narrower, more acute, and more distant, spreading leaves; and with suberect capsules; but this may perhaps belong to the next species.

347. 12. *Hypnum cæspitosum* Wilson (*green-patch Feather-Moss*); stems creeping, densely cæspitose, with short, simple, incurved branches; leaves spreading, subsecund, ovate, concave, serrulate, nerved above half-way, margin plane; fruitstalk rough; capsule oblong, curved, suberect; lid conical-rostellate. (Tab. LV.)

Scleropodium cæspitosum *Bryol. Eur.*
Hypnum cæspitosum *Wilson*, in Suppl. Eng. Bot. t. 2878.
Hypnum Touretii *Bridel*, Mant. Musc.?
H, illecebrum β. Touretii *Bridel*, Bryol. Univ.?

Hab. On walls of new red sandstone; and about the roots of trees, in places liable to inundation. In several places near Warrington; and between Frodsham and Helsby, Cheshire, *W. Wilson.* Sussex, frequent, *Messrs. Borrer and Mitten.* Yorkshire, *Mr. Spruce.* Fr. Nov.

Dioicous. More densely tufted than the preceding species; with shorter, more slender, less incurved branches, which are not obtuse at the apex. Leaves more loosely imbricated, more spreading, and subsecund, less concave, with a shorter nerve, which is sometimes forked. Perichætial leaves more attenuated at the apex, and somewhat recurved. Fruitstalk about ½ inch long, rough. Capsule less cernuous than in the preceding; oblong, or subcylindrical; somewhat arcuate. Lid rostellate, half as long as the capsule; the beak often longer in the Cheshire specimens than is shown in the figure in *Eng. Bot.;* and the capsule more truly subcylindrical and curved.

This moss is abundantly distinct from *Hypnum rutabulum* in its smaller size and compactly cæspitose habit; as well as in the different shape of the leaves, capsule, and lid; and in the dioicous inflorescence. From *H. illecebrum*, to which it is more nearly allied, it is distinguished by the suberect oblong capsule, and more lax, narrow leaves; characters already pointed out as belonging to *H. Touretii* of Bridel.

§ 3. *Rutabula.*

348. 13. *Hypnum rutabulum* Dill., Linn. (*common rough-stalked Feather-Moss*); monoicous; stem procumbent, irregularly branched; leaves loosely imbricated, spreading, ovate-acuminate, serrulate, substriated when dry, nerved above half-way; fruitstalk rough; capsule ovate-oblong, cernuous, arcuate; lid conical. (Tab. XXVI.)

Brachythecium rutabulum *Bryol. Eur.*
Hypnum rutabulum *Linn.* Sp. Pl. *Hedwig,* St. Crypt. iv. t. 12. *Turner. Smith. Web. and Mohr. Funck,* Deutsch. Moose, t. 44. n. 1. *Schwaegr. Bridel. Hook. and Tayl.*
Hypnum brevirostre *Smith,* in Eng. Bot. t. 1647. (not of *Ehrh.*)
Hypnum crenulatum *Smith,* Eng. Bot. t. 1261.
H. flavescens *Bridel? Dill.* Musc. t. 38. f. 29.

Hab. On banks, walls, and trees; very common. Fr. Nov.

Stem procumbent; or arched and rooting at the extremity; 2 or 3 inches long or more, loosely tufted, irregularly branched, occasionally subpinnate; branches erect. Leaves pale green, thin and membranaceous, concave, acuminate, the point sometimes slightly twisted; somewhat striated and scariose when dry; the thin nerve reaching above half-way. Perichætial leaves much recurved; showing the vaginula covered with numerous long paraphyses. Fruitstalk very rough, about 1 inch long. Capsule cernuous, arcuate, oblong. Lid conical, bluntish, with a small point.

The monoicous inflorescence essentially distinguishes this species from most of its allies; especially from *H. rivulare* and *H. cæspitosum.*

Numerous varieties are mentioned in Bridel's *Bryologia Universa*, which will require to be re-examined. *Hypnum chrysostomum* of Richard and Michaux must be referred to *H. plumosum*. *Hypnum Starkii* is distinct from *H. rutabulum*, and more nearly allied to *H. reflexum*.

349. 14. *Hypnum rivulare* Bruch (*River rough-stalked Feather-Moss*); dioicous; stems arched, or subpinnate; branches incurved, slender, attenuated; leaves spreading, deltoid-ovate, striated, serrated, decurrent, nerved above half-way; fruitstalk rough; capsule roundish-ovate, cernuous; lid conical, acuminate. (TAB. LV.)

Brachythecium rivulare *Byrol. Eur.*
Hypnum rivulare *Bruch*, in lit.
H. fontanum *Schleicher;* and H. denudatum *Turner MS.* in Herb. Turner.

Hab. On banks and stones by rivulets in shady woods; often growing in water, and then mostly barren and elongated. Cotteral Wood, near Manchester, Nov. 1828, *W. Wilson.* Yorkshire, *Mr. Spruce.* Sussex, *Mr. Borrer.* Near Todmorden, *John Nowell.* Afon Ro, near Conway. In rivulets at the foot of Snowdon, and elsewhere, near Llanberis.

Fr. Nov.

Somewhat smaller, and of a more slender habit than *H. rutabulum;* the younger branches attenuated. Leaves more or less decurrent at the base; tapering and acute, but not suddenly acuminated nor pointed; more evidently striated. Capsule short and roundish; not oblong and arcuate. Lid conical, very acute; sometimes almost as long as the capsule, and rostellate. Inflorescence dioicous. By these characters it is essentially distinguished from the preceding; with which it has perhaps been often confounded. When growing in water, the stems are often much elongated; and the foliage seems to be liable to much variation. We have seen the leaves roundish-ovate and very concave; approaching very nearly to those of *H. alpestre* and *H. murale.* The lower leaves have very frequently a reddish tint. This species is substituted for *H. rutabulum* in some copies of Drummond's *Musci Americani.*

C. Muller (*Synops. Musc.*) has improperly referred this moss to *H. chrysostomum* Richard, which is *H. plumosum*, according to a specimen in *Herb. Hook.* from Richard himself.

‡‡ Lid rostrate. *Prælonga.*

350. 15. *Hypnum crassinervium* Taylor (*thick-nerved Feather-Moss*); stem creeping; branches erect, crowded, simple, or fasciculate; leaves spreading, ovate, acuminate, concave, serrated, margin reflexed, nerved above half-way; fruitstalk rough; capsule narrowly ovate, cernuous; lid with a long beak. (TAB. LV.)

Hypnum crassinervium *Taylor*, in Fl. Hib. ed. 2. p. 43. *Wilson*, in Eng. Bot. Suppl. t. 2706. *Hook.* Eng. Fl.

"H. Schleicheri *Brid.*" *Myrin*, in Herb. Hooker.
"H. rutabulum var." from Sardinia, in Herb. Hooker.

Hab. On shady rocks, chiefly of limestone. Near Cork (barren), 1820, *Dr. Taylor.* Mucrus, near Killarney, and near Kenmare, Ireland. Near Beaumaris, Anglesey. Near Matlock, Derbyshire, *W. Wilson.* Yorkshire, *Mr. Spruce.* Fr. Nov.

Dioicous. Growing in dense bright or dark green patches; the dry foliage glossy. Branches ½ inch long or more, erect, cylindrical. Leaves very concave with reflexed or platter-edged margins, suddenly acuminated, serrated, substriated when dry; nerve thick, often forked. Fruitstalk 1 inch long, rough. Capsule slightly cernuous, small, elliptic-oblong, curved, pale brown. Lid as long as the capsule, with a slender beak.

Hypnum Vaucheri Lesquereux (*H. julicum* Sendtner) is a nearly allied dioicous species, intermediate between this and *H. piliferum;* but has a shortly rostrate lid; and the stems are arcuate, rooting at the extremity; branches curved. Barren specimens supposed to belong to this species, gathered "near Yarmouth, in 1815," are in the Herbarium of D. Turner, under the name of *H. piliferum*, intermixed with *Timmia austriaca;* hence some mistake as to the habitat is suspected to exist.

357. 16. *Hypnum piliferum* Vaill., Schreb. (*hair-pointed Feather-Moss*); dioicous; stem procumbent, pinnatedly branched, branches attenuated; leaves imbricated, elliptical, concave, with long narrow acuminations, serrulate, nerved half-way; fruitstalk rough; capsule ovate-oblong, cernuous; lid with a long beak. (TAB. XXV.)

Hypnum piliferum *Schreb.* Spic. Fl. Lips. p. 91. *Hedw.* St. Crypt. iv. t. 14. *Turner. Smith,* Eng. Bot. t. 1516. (figure good.) *Mougeot and Nestler,* No. 624. *Funck,* Deutsch. M. t. 43. n. 35. *Web. and Mohr. Hook. and Tayl. Schwaegr.* (not of *Greville,* Fl. Edin.)
H. cassubicum *Dickson* (not of *Scopoli*).

Hab. Shady banks and woods; rare in fructification. In fruit at Auchindenny, near Edinburgh, *Dr. Arnott.* Cotteral Wood, Cheshire, *W. Wilson.* Yorkshire, abundant, *Mr. Spruce* and *Mr. Ibbotson.* Fr. Nov.

Stems 2—4 inches long or more, flexible, and rather slender. Branches somewhat curved and attenuated. Leaves loosely imbricated, erecto-patent, appressed when dry, elliptic or elliptic-oblong; suddenly contracted into long narrow points, and hence almost piliferous; pale green; margin scarcely if at all reflexed, serrulate; areolæ narrow. Perichætial leaves recurved, attenuated above. Fruitstalk 1 inch long, rough. Capsule slightly arcuate, cernuous, oblong. Lid rostrate; as long as the capsule.

From this species *H. Vaucheri* Lesquereux differs as above-mentioned; and also in the more ovate leaves, less evidently serrulate.

52. 17. *Hypnum cirrhosum* Schwaegr. (*tendril-pointed Feather-*

Moss); stems erect, or procumbent, sparingly branched; branches erect, cylindrical; leaves imbricated, elliptic-oblong, with long, narrow, serrulate points; concave, nerved half-way. (TAB. LV.)

Hypnum cirrhosum *Schwaegr.* Suppl. i. 2. p. 214. *Funck*, Deutsch. M. t. 39.

Hab. Summit of Ben Lawers, July 1823, *Dr. Arnott.*

This moss has never yet been found anywhere with fruit. It occurs in similar situations on the Alps of Switzerland and Germany; and may possibly be only a variety of *H. piliferum;* though very different in its manner of growth: the leaf also is more oblong, entire, except at the apex, which is reflexed just below the long slender point; and the colour is yellowish and glossy.

353. 18. *Hypnum prælongum* Dill., Linn. (*prolonged Feather-Moss*); dioicous; stem arched or procumbent, sub-bipinnate, with slender attenuated branches; stem-leaves widely cordate-acuminate, squarrose; branch-leaves lanceolate-acuminate, serrate, nerved above half-way; fruitstalk rough; capsule oval-oblong, obliquely cernuous; lid with a long beak. (TAB. XXV.)

Hypnum prælongum *Linn.* Sp. Pl. 1591. (not *Hedwig*, St. Crypt. iv. t. 29.?) *Swartz. Turner. Smith*, Eng. Bot. t. 2035. *Schwaegr. Hook. and Tayl.* (partly). *Bridel* (partly). *Dill.* Musc. t. 35. f. 15. A.

var. β. Stokesii; stem more evidently bipinnate; branches crowded; stem-leaves striated, crowded; branch-leaves ovate-acuminate. (TAB. LV.)

H. Stokesii *Turn.* Musc. Hib. 159. t. 15. f. 2.

Hab. Moist shady banks, &c., frequent; var. β. on shady rocks by rivulets in mountainous places. Rocks near Lough Bray, *Dr. Stokes.* Cromagloun, near Killarney. Afon Ro, near Conway. Fr. Nov.

Stem mostly arched, often rooting at the extremity, 2 or 3 inches long; the apex of the shoots often much prolonged and flagelliform. Branches rather numerous; slender and attenuated. Leaves of the principal stem distant, widely spreading, squarrose, somewhat recurved; cordate, and semiamplexicaul at the base; suddenly and narrowly acuminated above; lower margin reflexed; branch-leaves lanceolate-acuminate, spreading; all of them distinctly serrated; their nerve reaching considerably more than half-way; areolæ long and narrow. Perichætial leaves recurved, nerveless, attenuated. Fruitstalk 1 inch long, rough. Capsule small, oval-oblong, olivaceous, with purplish spots at the base, where it is suddenly bent at an angle from the apex of the fruitstalk, as in *H. purum.* Lid with a long slender beak.

H. Stokesii, besides its more dense ramification and lurid green colour, has slender flagelliform shoots from the lower part of the stem; and the leaves are wider, shorter, and less acuminated than in *H. prælongum.* The original specimens have very short fruitstalks. In a perfect state this variety, or possibly distinct species, is unknown to us; and seems to merit further examination.

H. prælongum appears to be less frequent on the continent; or is not well known out of Britain. It differs from *H. Swartzii* in its manner of growth; in the slender branches; in the form and size of the leaves; and especially in the form, colour, and insertion of the small oblong capsules, which soon shrivel up after the fall of the lid.

154. 19. *Hypnum Swartzii* Turner (*Swartz's Feather-Moss*); dioicous; stem creeping or procumbent, with short, erect, or ascending branches; leaves uniform, spreading, subcomplanate, cordate, ovate, or ovate-lanceolate, serrated, nerved above half-way; fruitstalk rough; capsule ovate, cernuous; lid rostrate. (Tab. LV.)

Hypnum Swartzii *Turner*, Musc. Hib. p. 151. t. 14. f. 1. (only). *Smith*, Eng. Bot. t. 2034.
Hypnum prælongum *Hedw.* St. Crypt. iv. t. 29. *Funck*, Deutsch. Moose, t. 48. n. 60. *Hook. and Tayl.* (partly).
H. prælongum δ. atrovirens *Bridel.*
H. atrovirens *Swartz*, Musc. Suec.
"H. Schleicheri *Huebener*." *Hampe*, and *Funck* (not of *Bridel*).

Hab. Moist banks and rocks, frequent. In Winwick Stone Quarry, near Warrington, growing with *H. prælongum* and *H. pumilum*. Fr. Nov.

Stems creeping; never arched, and not so much elongated as in the preceding; never bipinnate, and not obviously pinnate; the branches more robust, not attenuated, erect, with compressed or complanate (not distichous) foliage. Stem-leaves cordate, acute, not acuminated; scarcely differing from those of the branches, which are larger than those of *H. prælongum*, and cordate, ovate, or ovate-lanceolate, not acuminated, of firmer texture and of a deeper green colour, glossy, and not shrinking when dry; areolæ long and narrow. Fruitstalk shorter. Capsule shorter, more turgid, roundish-ovate, of firmer texture; reddish-brown, not olivaceous; the base not suddenly bent at its insertion. The specimens distributed by Hampe and Funck under the name of *H. Schleicheri*, differ only in the less complanate and more crowded leaves of a yellowish-green colour; in habit resembling *H. strigosum* Hoffm., which is a very distinct species, with smooth fruitstalks and nidulant barren flowers.

H. Swartzii β. minus of Turner, *Musc. Hib.*, belongs to *H. pumilum*.

5. 20. *Hypnum speciosum* Bridel (*showy Feather-Moss*); synoicous; stem creeping, with erect, simple, subcomplanate branches; leaves ovate, subacuminate, serrulate, substriated when dry, nerved almost to the apex; fruitstalk rough; capsule ovate, tapering at the base, cernuous; lid rostrate. (Tab. LV.)

Hypnum speciosum *Bridel*, Mant. Musc. p. 156., Sp. Musc. ii. p. 105.
Hypnum macropodium *Bridel*, in Herb. Arnott!
Hypnum riparioides var. speciosum *Schwaegr.* Suppl. i. 2. p. 196.
H. prælongum var. *M. Requien*, in Herb. Arnott, from Avignon!

H. prælongum ζ. speciosum *Bridel*, Bryol. Univ. ii. 403.
H. androgynum *Wilson MSS.*
Rhynchostegium androgynum *Bryol. Eur.*

Hab. On stones near springs and at the roots of trees, growing with the preceding species. Well-side near Porth-Dafarch, two miles from Holyhead, Dec. 1830, *W. Wilson*. On bricks round a spring at Albourne Place, near Hurst Pierpoint, Sussex; and on the stem of a tree near Henfield, *Mr. Mitten.*
Fr. Dec.

Stems creeping extensively, often floating in water, with numerous erect simple branches, ½ inch long, and somewhat complanate. Leaves bright shining green; larger and more scariose than in *H. Swartzii;* spreading; erect and substriated when dry; ovate, shortly acuminated, serrulate; the narrow nerve continued to within a short distance from the apex. Perichætial leaves nearly erect; more shortly acuminated than in *H. prælongum.* Fruitstalk scarcely 1 inch long, rough. Capsule somewhat obovate; tapering gradually into the fruitstalk. Lid with a shorter beak, not so long as the capsule. Calyptra yellowish. Inflorescence synoicous.

This fine species is readily distinguished from *H. Swartzii*, with which it grows intermixed, by the large brilliant foliage; and is essentially characterised by the inflorescence. C. Müller, *Synop. Musc.*, improperly refers it to *H. Starkii* Bridel. The group to which our moss belongs contains some intricate species: *H. remotifolium* of Greville, Schwaegr. *Suppl.* t. 200., has the fruitstalk rough, not smooth, as hitherto described; and is very nearly allied to *H. speciosum;* having monoicous and occasionally synoicous flowers. *H. cordatum* Harvey, in *Musci Indici*, is also (according to the description and figure) closely allied; but we have seen no perfect specimen: compare, also, *H. vagans* Harvey. *H. hians* Hedw. *Sp. Musc.* has roundish-ovate, spreading leaves, and dioicous inflorescence.

356. 21. *Hypnum Teesdalii* Teesdale, Smith (*Teesdale's Feather-Moss*); monoicous; stem creeping, filiform; branches simple, erect, slender; leaves subcomplanate, spreading, lanceolate, rigid, subserrulate, with a broad nerve continued nearly to the apex; fruitstalk rough; capsule ovate, cernuous; lid rostrate. (Tab. LV.)

Rhynchostegium Teesdalii *Bryol. Eur.*
Hypnum Teesdalii *Smith*, Eng. Bot. t. 202. *Turner.*
Hypnum Schleicheri β. curvisetum *Bridel*, Bryol. Univ. *De Notaris*, Syll. Musc.
Hypnum intricatum *Dickson* (not *Schreb.*).
Hypnum rigidulum *Bruch*, in sched.
Hypnum Teneriffæ *Montagne*, in Hist. Canar (tab. iii.)
Hypnum pachyneuron *Taylor MS.* in Herb. Hooker.

Hab. On moist shady rocks, especially near waterfalls, in Wales, Scotland, England, and Ireland. Near Matlock, on trees, according to Smith (in *Eng. Bot.*). Near Bantry, *Miss Hutchins* (in *Herb. Turner*). Near Sedberg, Yorkshire, *Rev. G. Pinder.*
Fr. March—June.

A very minute species, growing in dark green patches; the branches very short, scarcely $\frac{1}{4}$ inch in length. Leaves rigid, very minute, often complanate or subdistichous, spreading, narrowly lanceolate or tapering, concave, serrulate towards the apex; the nerve very broad, extending nearly to the apex. Perichætial leaves erect, scarcely covering the vaginula. Fruitstalk less than $\frac{1}{2}$ inch long, rough. Capsule ovate, cernuous; with a rostrate lid of about the same length. Annulus wanting, or quite rudimentary. *H. rigidulum* Bruch is a slight variety, with broader leaves, and shorter, narrower nerve.

H. Teesdalii is well described in Turner's *Musc. Hib.* The habitat on trees near Matlock wants confirmation. It is mentioned in Hook. *Br. Fl.* as a variety of *H. tenellum*; but is essentially different in the rough fruitstalk.

357. 22. *Hypnum pumilum* Wilson (*Dwarf Feather-Moss*); dioicous; stem creeping, or procumbent, filiform, subpinnate; branches very slender, subcomplanate; leaves very small, ovate, spreading, serrulate, nerved half-way; perichætial leaves very small; fruitstalk rough; capsule roundish-ovate, cernuous; lid with a short beak. (TAB. LV.)

Hypnum pumilum *Wilson,* in Eng. Bot. Suppl. t. 2942. f. 1.
H. Swartzii β. minus *Turner,* Musc. Hib. p. 151. t. 14. f. 2.
H. prælongum ϑ. pallidirostrum *Bridel,* Bryol. Univ. ii. 767.
H. pallidirostrum *C. Müller,* Syn. Musc. ii. 413.

Hab. On shady rocks and on hedge-banks, in Ireland, Scotland, and England; probably not unfrequent, but overlooked on account of its small size; first observed in Winwick Stone Quarry, near Warrington. Ireland, *Mr. Templeton* (in *Herb. Turner*, named *H. serpens* and *H. Teesdalii*). *Miss Hutchins* (in *Herb. Turner*, named *H. Swartzii*). Var. β. by the Menai, near Bangor, with *H. Swartzii.* Fr. Nov.

This species is even smaller than the preceding, from which it essentially differs in the dioicous inflorescence. Leaves ovate, somewhat acuminate, scarcely concave; the margin, on the stem-leaves especially, somewhat reflexed at the base, but not decurrent, as in *H. prælongum:* all the leaves are widely spreading, not crowded, occasionally sub-bifarious; shrinking very much, and not at all glossy when dry; obscurely serrulate, faintly nerved half-way; areolæ rhomboid, rather large. Perichætial leaves recurved, very small, exposing a part of the vaginula. Fruitstalk not $\frac{1}{2}$ inch long, purplish, rough. Capsule short, cernuous, roundish, with a distinct annulus. Lid obliquely rostrate, rather shorter than the capsule.

To the naked eye the foliage of this species is scarcely distinguishable from that of *H. serpens*, with which it frequently grows intermixed; but under the microscope they are found to be very different. This is one of the smallest species of the genus; and has probably been often overlooked as a small state of *H. prælongum*, to which in most of the characters it is very nearly allied; but an attentive comparison will prove that they are truly distinct.

Hypnum Swartzii var. β. minus of Turn. is only a barren variety of this moss, with leaves more evidently bifarious, more distant, and elliptic-ovate, not acuminate. We have compared authentic specimens, and find no other difference. Irish specimens, in fruit, of *H. pumilum*, gathered by Mr. T. Drummond, seem to be quite intermediate.

b. Fruitstalk smooth.

+ Lid rostrate.

§ *Striata.*

358. 23. *Hypnum striatum* Hedw. (*common striated Feather-Moss*); dioicous; stems loosely tufted, arched or procumbent, subpinnate; branches attenuated at the apex, drooping; leaves widely spreading, cordate-acuminate, striated, serrated, nerved above half-way; capsule subcylindrical, curved, cernuous; lid rostrate. (TAB. XXVI.)

Hypnum striatum *Schreb.* Fl. Lips. p. 91. *Hedw.* St. Crypt. iv. t. 13. *Turner.* *Smith,* Eng. Bot. 1648. *Moug. and Nestl.* No. 142. *Funck,* Deutsch. Moose, t. 40. f. 34. *Schwaegr.* *Hook. and Tayl.* *C. Müller.*

Hypnum longirostrum *Ehrh.* *Web. and Mohr.* *Röhling.* *Bridel.* *Dill.* Musc. t. 38. f. 30. B.

Hab. Woods and shady banks; common. Fr. December.

Stems straggling, loosely tufted, elastic, about 2 inches long, rigid; arched and often rooting at the extremity; more or less pinnate; branches curved; sometimes rooting at the extremity. Leaves widely spreading, almost squarrose, strigose; gradually tapering from a wide cordate base; acute, distinctly striated or plicate, serrated; nerve ceasing above the middle. Perichætial leaves recurved. Vaginula very hairy. Fruitstalk nearly an inch long. Capsule arcuate. Lid as long as the capsule, with a curved slender beak. Calyptra yellowish, rather large.

Turner's var. *β. serratum*, ramis elongatis gracilibus, foliis serratis (in *Herb. Hooker*), is *H. myosuroides*, with barren flowers.

H. striatum somewhat resembles *H. rutabulum;* but is at once known by the rostrate lid, smooth fruitstalk, and tapering striated leaves.

359. 24. *Hypnum striatulum* Spruce (*lesser striated Feather-Moss*); dioïcous; stems creeping, densely tufted; branches crowded, erect; leaves erecto-patent, ovate-acuminate, substriated, serrated, nerved above half-way; capsule oblong, cernuous; lid rostrate. (TAB. LV.)

Hypnum striatulum *Spruce,* Ann. and Mag. Nat. Hist. 1849. Musc. Pyr. No. 79.

H. striatum var. Duriæanum *Montagne,* in Durieu's Asturian Collection, No. 139.

H. prælongum var. ε. filescens *Bridel,* Bryol. Univ. (fid. *C. Müller*).

H. filescens *C. Müller,* Syn. Musc. ii. 462.

Hab. On shady calcareous rocks, and at the roots of trees.

Mucrus, near Killarney, *W. Wilson.* St. Vincent's Rocks, and Leigh Woods, near Bristol, *Mr. Thwaites.* Arundel Park, Sussex, *Mr. Mitten.* Fr. Dec.

Scarcely half the size of *H. striatum.* Stems densely cæspitose, creeping. Branches crowded, erect, scarcely ½ inch long. Leaves much less spreading, crowded, more sharply acuminate, with longer tapering points, less evidently striated, serratures more obtuse and irregular; nerve stronger and more opaque; areolæ smaller and shorter, especially those of the base, which are dot-like and opaque, as in *H. circinnatum.* Perichætial leaves suberect. Vaginula less hairy. Fruitstalks ½ inch long, sometimes 2 together.

60. 25. *Hypnum strigosum* Hoffmann (*rustling Feather-Moss*); submonoicous; stem creeping, or decumbent, subpinnate; branches suberect, attenuated; leaves crowded, imbricated, spreading, widely cordate-ovate, concave, rather obtuse, serrated, nerved above half-way; capsule ovate, cernuous; lid rostrate. (Tab. LV.)

Hypnum strigosum *Hoffmann,* Deut. Fl. 2. p. 76. *Schwaegr. Web. and Mohr. Funck,* Deutsch. M. t. 46. *Röhling. Blandow. Wahlenb. Bridel.*
H. Thuringicum *Bridel,* Musc. Rec. *Röhling* (not of *Turner* Musc. Hib.).
H. pulchellum *Hedwig,* Sp. Musc. t. 68.

Hab. At the roots of trees, on banks, and on dry rocks. Found in Cornwall by the *Rev. Mr. Tozer,* according to specimens in the Hookerian Herbarium, the locality not stated. Fr. Spring (Bridel).

Stems 1 inch long and more, creeping or suberect, seldom pinnate. Branches more or less erect, about ½ inch long, subulate, tapering. Leaves crowded, less widely spreading, smaller than in *H. striatum,* not much altered by drying, substriated, yellowish-green, glossy and scariose when dry, roundish-ovate or cordate, rather obtuse, concave, serrated to the base, where the margin is slightly recurved, nerved above half-way; areolæ oblong-hexagonal, rather large. Fruitstalk above ½ inch long, smooth. Capsule and lid as in *H. striatum,* but smaller. Inflorescence quasi-monoicous; barren flowers nidulant amongst the leaves near the summit of an old branch.

This is a smaller species than *H. striatum,* in size and in manner of growth resembling *H. striatulum,* from which it differs in the shorter, more obtuse, concave leaves, and in the inflorescence.

The evidence on which we admit this as a British species is less conclusive than could be desired; yet we cannot think it insufficient, since *H. circinnatum* may occur all over Britain where the rocks are calcareous, and because *Trichostomum subulatum* has been admitted upon similar evidence. Dr. Scott's Irish specimen in *Herb. Turner,* called *H. Thuringicum,* appears to be *H. confertum var.*

1. 26. *Hypnum circinnatum* Bridel (*curving Feather-Moss*); dioicous; stems suberect, arcuate, subpinnate; branches subfasciculate, curved and drooping; leaves narrowly ovate-acumi-

nate, crowded, subsecund, serrulate, nerved almost to the apex; fruitstalk smooth; capsule ovate, cernuous, curved; lid rostrate. (TAB. LV.)

Hypnum strigosum β. circinnatum *Bridel*, Bryol. Univ. ii. 447.
Hypnum circinnatum *Bridel*, Mant. Musc. and Sp. Musc. *C. Müller*, Syn. Musc.
Hypnum Leskea *Greville*, in Lin. Trans. xv. t. 3.
Pterogonium nervosum *Arnott*, in lit. Specimens from Montpelier.
Pterogonium incurvescens *Wilson MS.*

Hab. On shady limestone rocks and walls. Tyfry, Anglesey, *W. Wilson.* Steep Holms, near Bristol, *Mr. Borrer.* Plentiful about Bristol, *Mr. Thwaites.* Gunwallo, Helston, Cornwall, and Tothill near Plymouth (with barren flowers), *Rev. C. A. Johns.* Fr. March.

This species is exceedingly rare in fruit, and the only known specimens in that state were collected near Algiers by M. Bové, in March 1839, and by Mr. D. Don in the Ionian Islands. These agree well with our native barren specimens, and are quite distinct from *Hypnum strigosum* of Hoffmann. Stems growing from a creeping rhizoma, almost as in *Pterogonium gracile* of authors (*Leptohymenium*), scarcely an inch long, the lower part erect and bare of branches, the upper part curved and deflexed, with bifarious, subfasciculate, drooping, curved branches. Leaves dull (not shining) green, erecto-patent, subsecund, erect when dry, narrowly ovate, serrulate at the apex; margin recurved below; nerve thick, ceasing very near the apex; areolæ oval, those at the marginal base smaller and quadrate. Fruitstalk ½ inch long, smooth. Capsule ovate-oblong, curved, cernuous. Lid obliquely rostrate, scarcely as long as the capsule. Annulus distinct. Peristome double, as in *Hypnum.*

Hypnum circinnatum differs thus from *H. strigosum*:—Branches fasciculate, curved, not erect. Leaves more crowded, not shining, narrower, of firmer texture, and opaque, more closely and minutely serrated; nerve thicker and more prolonged; margin recurved; areolæ wider and shorter, those at the base small and quadrate. Inflorescence truly dioicous.

§§ *Conferta.*

362. 27. *Hypnum ruscifolium* Dill. (*long-beaked water Feather-Moss*); monoicous; stem creeping, irregularly branched; branches procumbent, subfasciculate; leaves subcomplanate, spreading, roundish-ovate, serrated, nerved almost to the apex; capsule ovate, cernuous; lid rostrate. (TAB. XXVI.)

Rhynchostegium rusciforme *Bryol. Eur.*
Hypnum ruscifolium *Neck.* Meth. Musc. *Turner. Smith*, Eng. Bot. t. 1275. *Hook. and Tayl. Dill.* Musc. t. 38. f. 31. A., and t. 40. f. 44. A. B. C. (fide *Hook. and Arn.*).
Hypnum rusciforme *Weiss. Roth. Schrank. P. Beauv. Bridel.*

Hypnum riparioides *Hedw.* St. Crypt. iv. t. 4. *Schwaegr. Web. and Mohr. Mougeot and Nestler*, n. 427. *Funck*, Deutsch. Moose, t. 38. n. 5.

Hypnum atlanticum *Schleich. Desfont.* Fl. Atlant.

Hypnum rutabulum var. γ. virens *Turner*, Musc. Hib.

var. β. prolixum (Turner); branches elongated, cylindrical; fruitstalk shorter. *Turner*, Musc. Hib. p. 153. *Bridel. Dickson. Dill.* Musc. t. 38. f. 32. and t. 85. f. 20.

Hab. On rocks and stones in rivulets, frequent; var. β. in Ireland, and (according to Dillenius) in Applethwaite Beck, Skiddaw, Cumberland. Fr. Nov.

Stems at first creeping. Branches more or less elongated, procumbent or arched, or floating in water, rigid, sparingly branched, often simple. Leaves lurid green, of firm texture, somewhat complanate and subsecund, roundish-ovate, with a cordate not decurrent base, evidently serrated; the stout nerve continued almost to the apex; areolæ rather narrow. Perichætial leaves slightly reflexed, serrulate. Fruitstalk about ½ inch long, smooth. Capsule shortly ovate, of firm texture, tapering at the base, cernuous. Annulus scarcely any. Lid rostrate, as long as the capsule. Calyptra small, greenish. Inflorescence certainly monoicous, though Bridel asserts the contrary.

From the larger complanate varieties of *Hypnum confertum* this species may be known by the rounder, less membranous leaves, not acuminated, and by the thicker and longer nerve, as well as by the more robust and rigid habit.

In the Hookerian Herbarium is a curious variety of this species, of very different aspect from that of the typical form, from Laxlip, Ireland, with elongated, cylindrical or filiform, fasciculate branches, and smaller, roundish, very concave leaves, not at all complanate nor subsecund, and substriated when dry. It is without fruit, and deserves further investigation. It is probably var. ε. *alopecuroides* of Bridel. Perhaps var. β. *prolixum* Turn. may be the same, though that of Bridel seems to be different. *H. atlanticum* Brid. is a variety with secund leaves. Several other varieties are indicated in the *Bryologia Universa.*

13. 28. *Hypnum confertum* Dicks., Smith (*clustered Feather-Moss*); stem creeping, subpinnate; branches suberect; leaves crowded, subcomplanate or subsecund, spreading, ovate-acuminate, concave, serrulate, nerved half-way; fruitstalk smooth; capsule ovate, cernuous; lid rostrate. (TAB. XXVI.)

Rhynchostegium confertum *Byrol. Eur.*

Hypnum confertum *Dicks.* Crypt. Fasc. 4. t. 11. f. 14. *Smith*, Eng. Bot. t. 2407. *Schwaegr*, Suppl. t. 90. *Web. and Mohr. Hook. and Tayl. Bridel. P. Beauv. Funck*, Deutsch. Moose, t. 38. n. 8.

Hypnum Thuringicum *Turner.* Musc. Hib. (according to *Herb. Turner*).

var. β. serrulatum; leaves complanate.

H. serrulatum *Turner* (not *Hedwig?*) *Smith*, Eng. Bot. t. 1262. *Bridel? P. Beauv. Dill.* Musc. t. 38. f. 30. A.?

H. læte-virens *Smith*, Eng. Bot. t. 2553. (not of *Turner*, Musc. Hib.).
H. rotundifolium *Dickson* (not of *Scopoli*).
H. confertum var. β. serrulatum *Bridel.*

var. γ. megapolitanum; larger in all its parts; stems straggling, lax; leaves cordate-ovate, acuminate, loosely imbricated.
Rhynchostegium megapolitanum *Byrol. Eur.*
H. megapolitanum *Bland. Web. and Mohr. Schwaegr. Funck*, Deutsch. M. t. 43. *Bridel.*
H. scariosum *Tayl.* in Lond Journ. Bot.?

Hab. On rocks, walls, and trunks of trees, frequent. Var. β. near Todmorden, *Mr. John Nowell.* Var. γ. on sandy banks near the sea, Shoreham Beach, Sussex, *Mr. Mitten.* Near Liverpool. Fr. Oct.

Monoicous. Growing in bright green patches. A smaller species than the last, with creeping, subpinnate stems. Leaves often slightly secund, sometimes complanate, moderately spreading, ovate-acuminate, the thin nerve reaching above half-way. Capsule rather small, pale brown, ovate-oblong or ovate, cernuous, with a rostrate lid of the same length. The var. γ., from its larger size and more straggling habit, may be a different species, and is so considered in *Bryol. Europ.*, having the leaves larger, more acuminated or taper-pointed, and cordate at the base. Hedwig's specimen in *Herb. Turner*, from Pennsylvania, is a larger and more robust moss (*H. Sellowianum* Hornsch. in *Fl. Bras.?*), closely allied, indeed, to *H. confertum*, but probably distinct. Hedwig's figure (*Sp. Musc.* t. 60.) is not very expressive.

H. rotundifolium of Scopoli (Bridel, *Br. Univ.* ii. 768.) is a more delicate species, having leaves roundish-ovate and loosely reticulated, shrinking very much when dry, of a deep dull green colour, the nerve shorter; otherwise it is very nearly allied to *H. confertum.* The specimen sent by Mr. Dickson to Mr. Turner, named *H. rotundifolium*, is barren, and was accompanied by one of *H. palustre* in fruit. The latter of these, and a barren Irish specimen of *H. alopecurum*, are figured in *Turn. Musc. Hib.* t. 13. p. 149., under the name of *H. læte-virens.* Dr. Abbott's specimen named *H. rotundifolium*, in *Herb. Turner*, is a small state of *H. ruscifolium.*

Swartz appears not to have been well acquainted with *H. confertum.*

364. 29. *Hypnum murale* Dill., Neck. (*wall Feather-Moss*); stem creeping, with crowded, erect, roundish branches; leaves imbricated, erecto-patent, roundish-ovate, very concave, subserrulate, nerved half-way; capsule ovate; lid rostrate. (Tab. XXIV.)

Rhynchostegium murale *Bryol. Eur.*
Hypnum murale *Hedw.* St. Crypt. iv. t. 30.? *Turner. Smith*, Eng. Bot. t. 1038. (as "H. confertum"). *Mougeot and Nestler*, No. 145. *Funck*, Deutsch. Moose, t. 38. n. 7. *Schwaegr. Hook. and Tayl.*

Hypnum abbreviatum *Hedw.* Sp. Musc. t. 65. *Dill.* Musc. t. 41. f. 52.

Hypnum clavellatum *Linn.* Sp. Pl.

Hab. On walls and stones, especially in limestone districts; but elsewhere less frequent than the preceding species.

Fr. October.

Monoicous. Growing in pale shining green patches, the branches roundish with closely imbricated concave foliage. Leaves roundish-ovate, with very short points, not acuminated, very concave, cucullate at the apex, paler and more glossy than in the preceding species, scarcely serrulate. Perichætial leaves erect. Capsule rather less cernuous than that of *H. confertum.*

This species is most readily distinguished from *H. confertum* by the very concave, shortly pointed, not acuminate leaves, cucullate or boat-shaped at the apex, of a paler and more shining green colour. The figure given by Hedwig (if really intended for this species, and not for *H. confertum*) is not very expressive: all the leaves, except that given at fig. 6., are too much like those of *H. confertum.* The critical remarks of Smith in *Eng. Bot.* cannot be relied upon, as he did not then understand the species; nor does it appear that Bridel is correct in referring Hedwig's figure of *H. clavellatum* St. Crypt. iv. t. 30. fig. *a.* to *H. confertum,* since both the continuous nerve and the shape of the leaf are different. According to Bridel, *H. abbreviatum* of Hedwig (figured with nerveless leaves) is a variety (*β. abbreviatum*) of *H. murale*, with leaves loosely imbricated, membranous, and rather obtuse, and of a more delicate habit. Four other varieties are indicated in *Bryol. Universa. H. præcox* Swartz, has wider and more obtuse serrulate leaves, and is more nearly allied to *Leskea fasciculosa* Hedw. *Sp. Musc.* t. 54., and to *H. strigosum* Hoffm. (which is *H. pulchellum* Hedw. *Sp. Musc.* t. 68.).

65. 30. *Hypnum tenellum* Dickson (*tender awl-leaved Feather-Moss*); stem creeping; branches suberect, fasciculate; leaves erecto-patent, lanceolate-acuminate, entire, nerved above half-way; capsule ovate; lid rostrate. (TAB. XXIV.)

Rhynchostegium tenellum *Byrol. Eur.*

Hypnum tenellum *Dicks.* Crypt. Fasc. 4. t. 11. f. 12. *Turner. Smith,* Eng. Bot. t. 1859. (fig. of the leaf incorrect). *Schwaegr.* Suppl. ii. 1. 161. t. 144. *Hook. and Taylor.*

Hypnum Algirianum *Desfont.* Herb. *Bridel. Funck,* Deutsch. Moose, t. 43. (Pterigynandrum *Bridel,* Musc. Rec., and *P. Beauv.*)

Hypnum exiguum *Blandow,* in *Sturm,* Deutsch. Fl. Crypt.

Hypnum serpens var. *Röhling. Web. and Mohr.*

Hab. On walls and rocks, especially such as are calcareous.

Fr. Oct.

Monoicous. Branches short, slender, scarcely ¼ inch long. Leaves very narrow and tapering, silky, light green, those of the stem subsecund, looking upwards, the nerve rather obscure, or wholly discontinued near the apex. Perichætial leaves erect, small. Vaginula prominent. Fruitstalk smooth, ¼ inch long. Capsule ovate, cernuous. Lid nearly as long as the capsule. Calyptra rather large in proportion, twice as long as the lid, dimidiate.

A very small species, easily known by its narrow, almost setaceous, entire, silky foliage, smooth fruitstalk, and rostrate lid. Dickson's name for the species is retained here as the most expressive, and, according to Schwaegrichen, the most ancient; Bridel's argument to the contrary is not conclusive.

366. 31. *Hypnum catenulatum* Schwaegr. (*filiform Feather-Moss*); dioicous; stem creeping, subpinnate; branches erect, very slender, filiform; leaves imbricated, ovate, nerved half-way, margin recurved below, entire; capsule oval-oblong, subcernuous; lid with a short beak. (TAB. LV.)

Pseudoleskea catenulata *Bryol. Eur.*
Hypnum catenulatum *Schwaegr.* Suppl. i. 2. p. 219. *Bridel*, Byrol. Univ. ii. 450. (partly). *Funck*, Deutsch. Moose, t. 39. f. 16. (not of *Hooker and Taylor*).
Pterigynandrum catenulatum *Bridel*, Musc. Rec. ii. 1. 64. t. 5. f. 4. (fig. very bad and preposterous). (Grimmia *Web. and Mohr.*)

Hab. Alpine and subalpine rocks. Craig-na-hine, near Ben Lawers, *Dr. Arnott.* Highlands, *Mr. Edmondson.* Pennyghent, Yorkshire, *Mr. Ibbotson.* Not seen with fruit in Britain. Fr. Summer.

Growing in dense patches, about ½ inch in height. Stems slender and filiform, with filiform branches, subpinnate, branches suberect, often slightly curved. Leaves very minute, scarcely visible to the naked eye, spreading when moist, erect and appressed when dry, widely ovate, acute, entire, concave, margin reflexed below; hence the leaf assumes the appearance of being bistriate, as described by Schwaegrichen; nerve rather broad, ceasing a little more than halfway up; areolæ oval and dot-like. Perichætial leaves ovate-acuminate, erect. Fruitstalk smooth, ½ inch long. Capsule suberect, or cernuous, slightly curved, oval-oblong. Annulus subpersistent. Lid about half as long as the capsule. Peristome yellow; inner one with cilia. Spores greenish. Inflorescence dioicous.

This species has been greatly misunderstood, and has been confounded with *H. heteropterum* of Bruch, a very distinct species, both by Hooker and Taylor, and by Bridel, who had never seen the fruit. *H. heteropterum* (*catenulatum* of Hook. and Tayl.) differs in the leaves, which are oblique, subsecund, papillose, crenulate, faintly two-nerved at the base; stems pinnate: it is closely allied to *H. dimorphum.* In habit *H. catenulatum* much resembles *Pterigynandrum nervosum* Bridel (*Leskea Frölichii* of Schwaegrichen, and of Bruch and Schimper, but not of Bridel, and to be hereafter called *Leskea nervosa*), but that has longer leaves, and the nerve is subcontinuous. *Leskea Vaucheri* of Schimper (MS.) is more robust than *H. catenulatum*, stems more evidently pinnate, branches crowded, leaves longer and larger. No. 219. of Drummond's *Musci Americani* is a variety of *H. catenulatum.*

The shorter nerve and small shortly ovate leaves distinguish this from small varieties of the next species.

+ + Lid conical. *Serpentia.*

367. 32. *Hypnum atrovirens* Dickson (*dark-green Mountain Feather-Moss*); dioicous; stem prostrate, irregularly branched; branches suberect, simple, incurved; leaves imbricated, secund, ovate-lanceolate, acuminate, subserrulate, margin recurved, nerve subcontinuous; capsule subcernuous; lid conical. (Tab. XXVI.)

Pseudoleskea atrovirens *Bryol. Eur.*

Hypnum atrovirens *Dicks.* Crypt. Fasc. 2. p. 10. *Turner,* Musc. Hib. p. 169. (as to the barren Irish specimen only; not of *Dill.* Musc. t. 43. f. 67. which is probably *Helicodontium tenuirostre* Schwaegr.). *Smith,* Eng. Bot. t. 2422. *Hooker and Taylor.*

Hypnum filamentosum *Dicks.* Crypt. Fasc. 2. p. 11. *Smith. Bridel,* Sp. Musc. *Bertolini.*

H. implexum *Bridel.*

Leskia incurvata *Hedw.* Sp. Musc. t. 53. (not *H. incurvatum* Mohr. and Schwaegr.). *Funck,* Deutsch. Moose, t. 36. n. 7. *Moug. and Nestl.* n. 521. *Bridel.*

Hab. Alpine rocks, and, according to Dickson, upon trees in the Highlands; rare in fruit. Ben Lawers. Near Loch-ne-gat, on loose rocks. Ben Cruachpen. Fr. Spring.

Growing in rather lax patches of a brownish hue, varying much in the length and tenuity of the branches; when barren often very slender, almost filiform, in which state it is *H. filamentosum* of Dickson. In a fertile state the branches are shorter and thicker, scarcely 1 inch long, slightly incurved, rigid, and rather brittle. Leaves brownish, blackish when old, crowded, more or less secund, subpapillose, erect when dry, of firm texture, ovate-lanceolate, or ovate, with long tapering points, subserrulate above, margin recurved below (bistriate *Brid.*); nerve thick; continued almost or quite to the apex; areolæ small, oval. Fruitstalk about ½ inch long, smooth. Capsule subcylindrical, short, somewhat curved and subcernuous. Lid conical. Outer teeth reddish-brown; inner peristome with solitary cilia, which are fugacious or sometimes wanting. Calyptra small, brownish.

This moss somewhat resembles *H. filicinum* in the foliage, but its habit and ramification are wholly different. Its generic place is certainly among the *Hypna*, both as respects habit and the structure of the peristome.

H. attenuatum Eng. Bot. t. 2420., if not *Leskia rostrata* (from a foreign specimen?), may belong to this species.

68. 33. *Hypnum fluviatile* Swartz (*soft Brook-side Feather-Moss*); monoicous; stem procumbent; branches flaccid, simple, drooping or prostrate; leaves loosely imbricated, ovate, concave, acute, entire, strongly nerved, incurved when dry; capsule

elongated, slender, suberect, slightly curved; lid conical, acuminate. (TAB. LV.)

Hypnum fluviatile *Hedw.* Sp. Musc. t. 71. *Weber and Mohr*, Bot. Tasch. p. 303. *Bridel*, Bryol. Univ. (partly) (not of *Bruch and Schimper*, Bryol. Europ.).

Hab. On rocks and stones in shady rivulets, in mountainous districts. River Cegin, near Bangor, N. Wales, *W. Wilson.* Pentland Hills, Scotland, *Dr. Greville.* Rivulet at Matlock, and West Riding of York, *Mr. Teesdale*, in *Herb. Smith*, without name. Fr. May, June.

Growing in extensive patches. Branches usually quite prostrate, simple, about 1 inch in length, soft and pliant, not rigid. Leaves ovate, sometimes elliptic-lanceolate, not at all deltoid at the base nor decurrent, concave, suberect, loosely imbricated, upper and terminal ones slightly secund, acute not acuminate, lower ones lurid green, of thicker texture than in the next species, areolæ smaller; nerve reddish, opaque, stronger and thicker, especially in the upper part; margin quite entire, never serrulate; perichætial leaves elliptic-lanceolate, subacute, striated, very strongly nerved, erect. Fruitstalk about 1 inch long, smooth. Capsule inclined, slightly curved, slender; twice as long as in the next species, and less contracted below the mouth when dry; its walls of thicker texture. Annulus smaller, obscure, adhering to the margin of the fallen lid. Outer teeth smaller, more deeply coloured, reddish-brown, more closely barred. Spores green. Lid smaller, more acute. Nearly allied to the N. American *H. orthocladon*, which has wider cordate leaves and erect branches.

The history of *H. fluviatile* is curious. The original specimens were gathered by Swartz, who, however, at first overlooked it as a distinct species. The specimens grew intermixed with the nerveless form of *H. palustre* (*H. luridum* of Hedwig), and tufts of the mixture were sent by Swartz to Weber and Mohr, as showing "a transition from *H. luridum* into *H. fluviatile.*" (*Bot. Tasch.* p. 366.) In *Herb. Turner*, there is a similar specimen from Swartz, with this inscription: "I observe, now, that my *palustre* and my *fluviatile* are the same species, and that the latter in a more advanced stage becomes *filamentosum.*" At length, to *Herb. Hooker*, a similar specimen was sent by Swartz, with this remark: "sane pro varietate *H. palustris* olim habui, Hedwigius vero distinxit." This error reflects no discredit on Swartz, and was most probably occasioned by his having been perplexed with the nerved varieties of *H. palustre* found in other localities. In those days *H. palustre* (a species having the nerve singularly sportive according to local influences) was very much calculated to mislead; and it may be interesting here to review the opinions then entertained concerning it. The nerved form of *H. palustre* was first erroneously given in *English Botany*, t. 1303., under the name of *H. fluviatile* of Swartz and Hedwig, and in the description Smith says, "specimens from Swartz himself have determined it to be his *fluviatile*, as well as his *luridum;* but the *luridum* of Hedwig is the *palustre* of Linnæus, an erect species, whose leaves have no midrib." Here is a double mistake; for Swartz certainly understood *H. luridum* as Hedwig did, and Hedwig distinctly mentions, in his *Stirpes*, that he had his *luridum* from Swartz. The Swartzian specimen of *H. luridum*, in *Herb. Turner*, has nerveless leaves. The nerveless form of *H. palustre* (*luridum* of Hedwig) is given in *Eng. Bot.* t. 1665., under the name of *H. palustre* Lin. Concerning this form, it is remarkable that Swartz appears to have been imperfectly acquainted with it. A specimen gathered in the South of Ireland by Mr. Mackay, differing only in the larger size and more spreading foliage, was sent to Swartz (No. 14. to Dr. Swartz, 1806, in *Herb. Turner*), and is thus marked by him: "Seems nothing but *H. cupressiforme*." Of another of Mr. Mackay's specimens (No. 4. to Dr. Swartz, 1806, in *Herb. Turner*), somewhat smaller, Swartz says, "This I cannot decypher;" yet it differs very little in aspect, and not at all in essential character, from Swartz's own specimen of *H. luridum* in the same Herbarium. Another state of *H. palustre*, with leaves scarcely secund, is given in *Eng. Bot.* t. 2406., named *H. adnatum* Hedw., figured from specimens gathered at Rathmines, near Dublin, by Dr. Whitley Stokes. It is quite different from *H. adnatum* of Hedwig. The nerved state of *H. palustre* was also confounded with *H. plumosum*. The strongly nerved form, called *H. subsphæricarpon* by Bridel, is called, in *Herb. Turner*, a variety of *H. fluviatile*, and indeed comes very near to it in the form and structure of the leaf. In the present day, when *H. palustre* has become better known, and there is no danger of confusion with that species, *H. fluviatile* is again exposed to misinterpretation, in consequence of its resemblance to *H. irriguum*.

/8x 33*. *Hypnum irriguum* Hook. and Wils. (*rigid Brook-side Feather-Moss*); monoicous; stem rigid; branches pinnate; leaves secund, spreading, deltoid-ovate, acuminate, subserrulate, strongly nerved; capsule oblong, curved, cernuous, when dry strongly arcuate and contracted below the mouth; annulus subpersistent; lid conical. (TAB. XXV.)

Amblystegium fluviatile *Bruch and Schimper*, Bryol. Europ. Monogr. t. 5.

Hypnum fluviatile *C. Müller*, Syn. Musc. p. 420.

Hab. On stones, in rivulets, and by mill dams, &c., not unfrequent. Sussex, *Mr. Borrer*. Yorkshire, *Mr. Spruce*. Cheshire; Breiddin Hill, Montgomeryshire; Felyn Esgob, on the river Cegin, near Bangor, near the station where *H. fluviatile* is found, *W. Wilson*. Near Ludlow, *Miss Atwood*. Fr. April.

Growing in procumbent patches, often intermixed with *H. filicinum*, and not very different in aspect. Stems usually or always pinnate, rigid, and rather brittle. Leaves usually more distant and spreading than in the true *H. fluviatile*, secund, sometimes almost falcate; more or less straggling when dry, gradually tapering to a point from near the base, where they are deltoid-ovate and somewhat decurrent, closely resembling those of *H. filicinum*, and withal subserrulate, never quite entire; nerve strong, continued almost or quite to the apex. Perichætial leaves ovate lanceolate, acuminate, strongly nerved, erect. Capsule shorter and more curved than in *H. fluviatile*, more cernuous, remarkably arcuate when dry, more contracted below the mouth, its walls of much thinner texture. Peristome larger; outer teeth yellow, suddenly attenuated above. Annulus more distinct, pale, adhering to the mouth of the capsule, which is destitute of the red border. Spores brown.

H. irriguum has much affinity with the strongly nerved form of *H. serpens*; differing in the larger size and opaque areolation. It is very liable to be mistaken for a form of *H. filicinum*, but is essentially different in the monoicous inflorescence.

369. 34. *Hypnum elodes* Spruce (*fine-leaved marsh Feather-Moss*); dioicous; stem slender, procumbent, subpinnate; branches slender, suberect; leaves loosely imbricated, spreading, subsecund, lanceolate-acuminate, entire, nerved almost to the apex; capsule oblong, cernuous, curved; lid conical. (Tab. LVI.)

Hypnum elodes *Spruce*, in Lond. Journ. Botany, April, 1845 (not of *Web. and Mohr*).
Hypnum polymorphum *Taylor*, in Flora Hibern. ed. 2. p. 44. (not of *Hedwig*, nor of *Hook. and Tayl.*).
H. commutatum var. *Dalton*, in Herb. Turner.

Hab. In wet places and in bogs. Bog at Killiney, near Dublin, July, 1814, *Dr. Taylor* (with old capsules). In wet places on Stockton Forest, near York, growing with *H. scorpioides* and *H. lycopodioides*, *Mr. Spruce* (with fertile flowers). Yorkshire, 1805, *Rev. J. Dalton*; and Anglesey, *Rev. H. Davies* (in *Herb. Turner*, named *H. polymorphum*). Southport, near Liverpool. Fr. April, May.

Stems more or less procumbent, when crowded suberect, 1½ inch long and more, weak and slender, subpinnate, with slender branches ⅓ inch long. Leaves small, distant, spreading, those of the branches narrowly lanceolate, or almost subulate, secund, the terminal ones almost falcate; those of the stem wider and less evidently secund; all of them brownish, entire, except towards the base, and there subdenticulate, concave, the strong evident nerve continued to the apex, or ceasing just below it; areolæ narrow and elongated. Perichætial leaves erect, nerved. Fruitstalk 1½ inch long, smooth. Capsule subcylindrical, incurved, cernuous. Lid (seen only in a fallen state) conical. Barren-flowered plants not seen.

This species is not unlike very small slender states of *H. filicinum*, and also bears some resemblance to *H. chrysophyllum*; it differs from the latter in the narrow lanceolate leaves, and in the longer and thicker nerve. From *H. fluviatile* it differs in its more slender delicate habit, pinnate stems, and narrow leaves of closer texture, as well as in the dioicous inflorescence. It may be considered as an intermediate species between *H. serpens* and *H. fluviatile*, with leaves very much acuminated, and their points almost setaceous.

370. 35. *Hypnum serpens* Dill., Linn. (*creeping Feather-Moss*); monoicous; stem creeping, subpinnate; branches simple, filiform, suberect; leaves spreading, ovate-lanceolate, acuminate, entire, nerved half-way or almost to the apex; capsule subcylindrical, curved, cernuous; lid conical. (Tab. XXIV.)

Amblystegium serpens *Bryol. Eur.*

Hypnum serpens *Linn.* Sp. Pl. 1596. *Hedw.* St. Crypt. iv. t. 18. *Turn.* Musc. Hib. *Smith*, Eng. Bot. t. 1037. (leaf not well described). *Moug and Nestl.* n. 332. *Funck*, Deutsch. Moose, t. 45. f. 50. *Bridel. Web. and Mohr. Hook. and Tayl.*

Hypnum contextum *Hedw.* Sp. Musc. t. 72. *P. Beauv.*

Hypnum spinulosum *Hedw.* Sp. Musc. t. 69.

Hypnum subtile *Dicks. Turner. Smith*, Eng. Bot. t. 2496. (as to the British specimens, but not as to the figure and description, which are taken from foreign specimens of the true *Leskea subtilis* Hedw.) *Dill.* Musc. t. 42. f. 64.

Hab. On walls, moist banks, trunks of trees, &c., very common. Fr. April, May.

This very common species is subject to considerable variation in the length of the nerve, and occasionally also in its size and general aspect, approaching to *H. irriguum.* Stems creeping; branches slender. Leaves very small, spreading, erect when dry, concave, entire, taper-pointed; the faint nerve in most of the varieties extending about half-way; in some varieties very short and obscure; in others, from wet shady places, more evident, and continued nearly or quite to the apex of the leaf; areolæ rather large for the size of the leaf, rhomboid, or oblong-hexagonal. Fruitstalk smooth, varying in length. Capsule oblong, curved, cernuous, sometimes (when growing on wet shady rocks) much elongated, with a distinct apophysis, sometimes (on dry exposed walls) very short, small, and almost obovate. Lid conico-convex, acute. Calyptra white. Inflorescence distinctly monoicous.

This species is readily known from its allies by its small size and slender habit, and by the small acutely tapering leaves, usually nerved half-way. Bridel considers the typical form of the species to be that which has the nerve subexcurrent; but the most frequent form in Britain is the one with leaves faintly nerved half-way.

The varieties with a longer nerve differ from *H. irriguum* in the smaller very acute leaves, tapering from an ovate base, and in the thinner nerve, as also in the smaller size of the whole plant. *H. viride* of Schleicher, is one of the many varieties (var. δ. of Bridel) of this species. A remarkable variety with leaves broadly deltoid-ovate-acuminate, widely spreading and distant, grows in damp osieries, near Warrington; and intermediate forms connecting it with the ordinary state of *H. serpens* are found by the side of Rosthern Mere, in Cheshire.

0x 35*. *Hypnum radicale* Pal. Beauv., Schwaegr. (*long-stalked creeping Feather-Moss*); monoicous; stem creeping, irregularly branched; branches rigid, suberect; leaves more or less spreading, cordate-ovate, or ovate-lanceolate from a cordate or deltoid base, all of them acuminate, nerve vanishing near the apex; perichætial leaves larger, wider, membranous, serrated, the nerve vanishing below the apex; fruitstalk very long;

capsule arcuate, oblong, cernuous; lid conical, shortly and sharply rostellate. (Tab. XXVI.)

Hypnum radicale *P. Beauv.* Prodr. *Bridel,* Mant. Musc. *Schwaegr.* Suppl. t. 90.
Stereodon radicalis *Bridel,* Bryol. Univ.
H. humile *P. Beauv. MS.*
Amblystegium radicale *Bryol. Europ.* Monogr. t. 4.?
Hypnum trichopodium *Schultz?*

Hab. On moist ground, amongst grass. Near Porth Dafarch, Holyhead, sparingly, *W. Wilson.* Near the Devil's Bridge, S. Wales, *J. E. Bowman.* Fr. April, May.

Bridel remarks of this, "a St. serpentis varietatibus grandioribus ægre distinguendus;" but Schwaegrichen says, "setâ, ratione caulis prælongâ, facile dignoscitur." It is indeed closely allied to *H. serpens;* but differs as follows: Stem rigid, rather fragile, more robust. Stem-leaves twice as large, of firmer texture, wider and more cordate below, the nerve well defined and continued almost to the apex. Perichætial leaves wider, serrated above, the nerve shorter. Fruit-stalk about 2 inches long. Capsule pale uniform brown; not red at the mouth. Annulus very narrow and indistinct. Lid longer, sharply rostellate. Teeth of the peristome wider and more pellucid. Spores nearly twice as wide.

Our plants differ from the figure of *Amblystegium radicale* in *Bryol. Europ.* in the perichætial leaves. Authentic specimens, given by P. Beauv., have been compared and identified with ours. The Holyhead specimens have the leaves somewhat narrower and more produced at the points than those gathered in S. Wales; but the authentic examples are equally variable. *Hypnum trichopodium* of Schultz (*H. Schultzii* of Blandow, and *H. riparium var. ε.* of Bridel) very closely resembles *H. radicale,* and may perhaps be the same species. We have seen only imperfect specimens, wanting the operculum.

370. 36. *Hypnum riparium* Dill., Linn. (*short-beaked water Feather-Moss*); monoicous; stem procumbent, subpinnate; branches complanate; leaves spreading, lax, ovate-lanceolate, entire, nerved above half-way; capsule oblong, curved, cernuous; lid conical. (Tab. XXIV.)

Amblystegium riparium *Bryol. Eur.*
Hypnum riparium *Linn.* Sp. Pl. 1595. *Dill.* Musc. t. 40. f. 44. B. C. D., and t. 34. f. 6. (partly), according to *Hooker* and *Arnott. Hedw.* St. Crypt. iv. t. 3. *Turner. Smith,* Eng. Bot. t. 2060. *Web. and Mohr. Schwaegr. Funck,* Deutsch. Moose, t. 37. n. 4. *Bridel. Hook. and Tayl.*
Hypnum longifolium *Bridel.*
Hypnum laxum *P. Beauv.*
Hypnum polycarpon *Bland.* in *Sturm,* Fl. Germ. Crypt. fasc. 14. *Mougeot and Nestler,* n. 1034. ?

Hab. On stones and on the trunks of trees, &c., on the borders of pools and ditches, and in spots occasionally overflowed; frequent. Fr. May, June.

A much larger species than *H. serpens*, often growing in water, when the stems and branches are much elongated, in habit resembling a *Fontinalis:* in that state, it is usually barren; when fertile, the stems are 1 or 2 inches long, creeping, with procumbent or suberect branches and complanate foliage. Leaves spreading, sometimes subsecund, usually subcomplanate, ovate-lanceolate, entire, nerved above half-way; areolæ narrow, elongated. Fruitstalk about 1 inch long, smooth. Capsule oblong, curved, cernuous. Lid convex, pointed. The inflorescence is monoicous, not dioicous, as stated in *C. Müll. Synops. Musc.*

Hypnum riparium is allied to *H. fluitans*, which has narrower, tapering, falcato-secund leaves, and erect pinnate stems. *H. polycarpon* of Blandow, seems to be almost exactly intermediate between these two species. Mr. Mitten has found a barren moss in Henfield Level, Sussex, which appears to be the same. Many varieties of *H. riparium* are indicated by Bridel, and to these, perhaps, should be added *H. Sipho* Boscq., Pal. Beauv., *H. pallidum* Schwaegr., and *H. flexipes* Brid. For our remarks on *H. trichopodium* Schultz, see *H. radicale.*

** Leaves acute, mostly squarrose, shortly nerved, or nerveless.

§ *Stellata.*

371. 37. *Hypnum polygamum* Bryol. Eur. (*cluster-flowered Feather-Moss*); polygamous, with clustered flowers; stem procumbent, subpinnate; leaves widely spreading, ovate-lanceolate, acuminate, entire, nerved half-way; capsule oblong, subcernuous; lid conical. (Tab. LVI.)

Amblystegium polygamum *Bryol. Europ.*
Hypnum stellatum *Drummond,* Musc. Americ. No. 184. (partly).
Hypnum polymorphum *Hook. and Tayl.* (as to the specimens from *Dr. Greville*).
Hypnum nodiflorum *Wilson MS.*

var. β. stagnatum; stems longer, suberect, and more pinnate; leaves with a longer nerve; fruitstalk elongated.
Hypnum stagnatum *Wilson MS.*

Hab. In wet swampy places. Southport. Sands of Barry, near Dundee, *Dr. Greville,* and *Mr. Drummond.* Portmarnock Sands, near Dublin, *Mr. D. Moore.* Var. β. near Newton Viaduct, 5 miles from Warrington, *W. Wilson.* Near York, *Mr. Spruce.* Near Copgrove, Yorkshire, *Rev. J. Dalton* (in *Herb. Turner,* named *H. stellatum*). Near Airth, *Mr. Lyle.* Fr. May.

Growing in bright fulvous patches. Stems 1 inch long or more, in the var. β. often 3 or 4 inches, and even longer, more or less pinnate; branches short, slender, spreading. Leaves widely patent, almost squarrose, not much altered, though slightly twisted when dry, of a bright fulvous yellow colour (var. β. of a darker hue); stem-leaves cordate-ovate, acuminate, those of the branches ovate-lanceolate, tapering to an acute point, entire, with plane margin, nerved above half-way (in the American specimens often two-nerved at the base; in the var β. with a longer and more evident nerve); areolæ narrow, larger at the base. Perichætial leaves erect, striated. Fruitstalk 1 inch long, smooth (above 2 inches in the var. β.). Capsule smaller than in *H. stellatum*, and less cernuous, oblong, curved, pale reddish-brown. Lid convex, pointed. Inflorescence polygamous; flowers often 4 together, the central ones barren; but frequently the archegonia and antheridia are intermixed in the same flower.

In general aspect this species resembles *H. stellatum*, but the leaves are longer, less squarrose, less dilated at the base, and evidently nerved; the capsule is smaller and more erect, and the inflorescence is different. The leaves of *H. polygamum* are not unlike those of *H. polycarpon* Blandow, and of *H. riparium*, but are more scariose, not flaccid, and more spreading; from these it is essentially distinguished by the inflorescence, as also from *H. chrysophyllum* and from *H. elodes*, which have differently shaped leaves. *H. aduncum* has secund leaves with a longer nerve, and is dioicous. *H. trichopodium* of Bridel has shorter leaves, with larger areolæ, and monoicous inflorescence. The foliage of *H. polygamum*, when growing in exposed sandy places, is of a brighter and deeper yellow than we have ever noticed in *H. stellatum*. The specific name already published in *Bryol. Eur.* appears to claim priority to that of *nodiflorum*, and is therefore adopted here.

372. 38. *Hypnum stellatum* Dill., Schreb. (*yellow starry Feather-Moss*); dioicous; stems erect, cæspitose, irregularly branched or subpinnate; branches erect, with terminal cuspidate foliage; leaves squarrose, recurved, deltoid-ovate, acuminate, entire, nerveless, with large diaphanous cellules at the base; capsule oblong, curved, cernuous; lid conical. (TAB. XXVI.)

Hypnum stellatum *Schreb.* Fl. Lips. p. 92. *Hedw.* Sp. Musc. *Turner. Smith,* Eng. Bot. t. 1302. *Moug. and Nestl.* n. 234. *Funck,* Deutsch. Moose, t. 47. n. 56. *Schwaegr. Hook. and Tayl. Bridel. Dill.* Musc. t. 39. f. 35.

Hypnum protensum *Bridel* (not of *Turner*, Musc. Hib.?)

Hab. In marshes and bogs, not uncommon. Fr. June.

Stems 2 or 3 inches high, densely tufted, the terminal foliage cuspidate. Leaves widely spreading and somewhat recurved, yellowish-green, crowded; deltoid-ovate, and much dilated below; with long tapering points, entire, the margin reflexed towards the base, nerveless, or sometimes faintly two-nerved at the base; areolæ narrow, elongated; large, and diaphanous at the base on each side. Fruitstalk smooth, 1½ inch long. Capsule arcuate, oblong, cernuous. Lid convex, pointed. Inflorescence dioicous.

Dr. Scott's specimen named *H. protensum* Brid., in *Herb. Turner*, is certainly *H. filicinum*.

373. 39. *Hypnum chrysophyllum* Bridel (*golden-leaved Feather-Moss*); dioicous; stem creeping or procumbent, pinnate; leaves widely spreading, subsquarrose, subsecund, cordate-ovate, acu-

minate, entire, nerved above half-way; capsule subcylindrical, curved, cernuous; lid conical. (TAB. XXVI.)

Hypnum chrysophyllum *Bridel*, Mant. Musc. *Schultz. Schwaegr. Röhling. Funck*, Deutsch. Moose, t. 47. n. 58. *Moug. and Nestl.* n. 731.

H. (Stereodon) chrysophyllus *Bridel*, Bryol. Univ. ii. 598.

Hypnum polymorphum *Hook. and Tayl.*, partly (not of *Hedwig*). *Hooker*, in Eng. Bot. Suppl. t. 2671. (figure not expressive).

H. protensum *Winch*, in Herb. Turner.

Hab. In fallow ground, in a clayey or marshy soil; also on chalk hills; not common in fruit. In fallow fields near Grappenhall, and near Over, &c., Cheshire. Near Newton Viaduct, with *H. stellatum*, *W. Wilson.* On walls at Orford, near Warrington, with barren flowers, growing with *H. serpens.* Plentiful in Sussex, but barren, *Messrs. Borrer and Mitten.* Fr. May.

A smaller species than *H. stellatum*, of which it is now generally thought to be a variety, but differing as follows: Stems procumbent and pinnate, not erect and densely tufted, as in that; leaves less squarrose, subsecund, less dilated at the base, where it is cordate-ovate (not deltoid), and destitute of the large diaphanous areolæ so conspicuous in *H. stellatum*, more gradually tapering above, the margin not reflexed below; nerve rarely absent, extending above half-way; terminal foliage at the apex of the shoots not cuspidate.

74. 40. *Hypnum polymorphum* Hedw. (*dwarf starry Feather-Moss*); monoicous; stem procumbent, scarcely pinnate; branches simple, erect, slender; leaves crowded, spreading, subsquarrose, subsecund, ovate-lanceolate, acuminate, entire, nerveless; capsule oblong, curved, cernuous; lid conical. (TAB. LVI.)

Hypnum polymorphum *Hedw.* Sp. Musc. t. 66. (fig. not good). *Funck*, Deutsch. Moose, t. 47. n. 59.

Hypnum stellatum γ. polymorphum *Bridel*, Bryol. Univ. ii. 603.

Hypnum affine *Sommerfelt*, Suppl. Fl. Lapp.

Hypnum Sommerfeltii *Myrin*, in Ann. Bot. Acad. Sc. Holm. 1831, p. 328.

Hypnum squarrulosum *Smith*, in Eng. Bot. t. 1709.

Hab. On walls, rocks, and banks, in limestone districts. Near the quarries, by the Menai, near Bangor, on declivities, May, 1828, *W. Wilson.* On moist limestone rocks at Crambeck, near Castle Howard, Yorkshire, *Mr. Spruce.* Mackershaw Wood, near Ripon, *Mr. Brunton* (see *Eng. Bot.*). Vale of Derwent, on the ruins of Kirkham Abbey, *Mr. Spruce.* Fr. May.

A very small species; smaller even than *H. chrysophyllum*, with leaves more crowded, less squarrose, and somewhat narrower at the base, nerveless; areolæ rather larger and wider. Essentially distinguished by the monoicous inflorescence. The specimen of *H. Sommer-*

feltii, from Myrin, in *Herb. Hook.*, differs merely in having the leaves subdenticulate below. *Hypnum hispidulum* (*H. stellatum ε. hispidulus* of Bridel), a North American variety or nearly allied species, has wider, shorter, serrulate leaves, often two-nerved at the base: specimens of this are given in Drummond's *American Mosses of the Southern States*, No. 147. and in *Musci Alleghanienses* of Sullivant and Gray, No. 37.: it approaches to *H. Halleri.* Sommerfelt's specimens of *H. affine* are almost intermediate; but most resemble *H. hispidulum.*

A specimen from Miss Hutchins, in *Herb. Turner*, named *H. squarrosulum*, belongs to *H. filicinum*, and is a var. with almost nerveless leaves. This may be *H. protensum* Turner, *Musc. Hib.*

375. 41. *Hypnum Halleri* Linn. jun. (*Haller's Feather Moss*); monoicous; stem creeping, pinnate, or with short erect branches; leaves crowded, widely spreading and recurved, broadly ovate-acuminate, serrulate, obsoletely two-nerved at the base; capsule oblong, curved, cernuous; lid conical. (TAB. XXXV.)

Hypnum Halleri *Linn. jun.* Meth. Musc. p. 375. *Hedw.* St. Crypt. iv. t. 21. *Schwaegr.* Suppl. i. 2. 283. (excl. the syn. of *H. dimorphum*). *Web. and Mohr. Funck*, Deutsch. Moose, t. 49. n. 64. *Moug. and Nestl.* n. 626. *Greville*, Scot. Crypt. Fl. t. 74. *Hook. and Tayl. Bridel. Haller*, Hist. St. Helv. n. 1734. and Emend. iii. n. 33.

H. flagellare *Gmelin.* Leskea flagellaris *Schrank.*

Hab. Alpine rocks, rare. Near the summit of Ben Lawers, *Greville, Arnott, Hooker and Wilson.* Ben Cruiban, *Arnott.* In Herefordshire, according to specimens from *Mr. Dickson* in Mr. Turner's Herbarium. Fr. August.

Growing in dense brownish patches; the outer stems creeping and pinnate, as usual in most of the species; the inner portion of the patches with crowded, short, erect branches. Leaves much recurved, crowded, not changed when dry, roundish-ovate, shortly acuminate, minutely denticulate; margin slightly reflexed near the base, often nerveless, mostly two-nerved at the base; areolæ rather larger than in *H. polymorphum*, rhomboid or oblong and uniform. Perichætial leaves erect. Fruitstalk above ½ inch long, smooth. Capsule cernuous, curved. Lid conical, bluntish, yellow. Inflorescence certainly monoicous, though Bridel says the contrary.

This species is of about the same size as the preceding: it differs in the more crowded erect branches, more recurved and shorter leaves, of a brownish hue, black when old, and more evidently denticulate.

§§ *Dimorpha.*

376. 42. *Hypnum dimorphum* Bridel (*dimorphous Feather-Moss*); dioicous; stem procumbent, vaguely pinnate; branches distant; leaves dimorphous, those of the stem spreading and recurved, ovate-acuminate; branch-leaves suberect, roundish-ovate, concave, obtuse, subamplexicaul; all of them denticulate and faintly two-nerved at the base; capsule oblong, cernuous; lid conical. (TAB. XXXV.)

Heterocladium dimorphum *Bryol. Eur.*
Hypnum dimorphum *Bridel,* Mant. Musc. p. 165. and Bryol. Univ. ii. 581. *Funck,* Deutsch. Moose, t. 49. n. 65. *Moug. and Nestl.* n. 627. *Greville,* Scot. Crypt. Fl. t. 160. (fig. very good). *Hook. and Tayl.*
H. squarrosulum *Voit,* in *Sturm,* Fl. Germ. Crypt. ii. fasc. 11.
H. brevifolium *and* diversifolium *Schleicher.*
H. Halleri var. *Schwaegr.*

Hab. Alpine rocks, rare. On Ben Lawers, under large broken masses of rock, not far from the summit (barren), *Arnott, Greville and Hooker.* Fr. Summer?

Stems 1 or 2 inches long, creeping or procumbent, more or less pinnate; branches slender, subfiliform. Leaves yellowish-green, not at all glossy; those of the stem distant, spreading and recurved, both in a wet and in a dry state, acuminated; branch-leaves more crowded, suberect, appressed when dry, roundish-ovate, rather obtuse and concave, the lower part amplexicaul, somewhat papillose at the back near the apex, distinctly denticulate, faintly two-nerved at the base; marginal areolæ quadrate; the central ones longer, larger, and less opaque. Perichætial leaves reflexed. Fruitstalk $\frac{1}{2}$ inch long, smooth. Capsule and lid almost as in the preceding. Inflorescence certainly dioicous.

Though formerly confounded with *H. Halleri,* this species is very different in habit; in the colour, direction, form, and texture of the leaves; and in the inflorescence. Sometimes the branches present no inconsiderable resemblance to *Leskea moniliformis.* The leaves, however, are more like those of *Hypnum heteropterum* than of any other species.

7. 43. *Hypnum heteropterum* Bruch (*wry-leaved Feather-Moss*); dioicous; stems procumbent, more or less pinnate, often flagelliform and rooting at the extremity; branches subfasciculate, deflexed; leaves obliquely imbricated, subsecund, ovate-acuminate, denticulate, subpapillose, two-nerved at the base; capsule elliptic-oblong, cernuous; lid rostrate. (TAB. XXIV.)

Heterocladium heteropterum *Bryol. Eur.*
Hypnum heteropterum *Bruch,* olim, in lit.
Pterogonium heteropterum *Schwaegr.* Suppl. t. 210. b.
P. filiforme *Smith,* Eng. Bot. t. 2526. (as to the Irish specimen only).
Pterigynandrum heteropterum *Bridel,* Bryol. Univ. ii. 176.
Hypnum atrovirens *Turner,* Musc. Hib.
Hypnum catenulatum *Hook. and Tayl.* Musc. Brit. ed. 2. p. 160. t. 24. *Bridel,* Bryol. Univ. ii. 450. partly (not of *Schwaegr.*).
Hypnum rigidum *Taylor MSS.*

Hab. On moist shady rocks, near waterfalls; rare in fruit. Wet rocks at the Dargle, and at Powerscourt near Dublin, abundant. Near Aber, Beddgelert, and Dolgelley, N. Wales, in fruit, *W. Wilson.* Near Belfast, *T. Drummond.* Castle Kelly Mountains, *Dr. Taylor.* Fr. Nov.

Stems growing in rather dense patches, of a dark green colour, sometimes yellowish-brown, procumbent; branches pinnate or fasciculate, somewhat curved and drooping; when barren often very slender, in which state it has been regarded as a variety of *Pterogonium filiforme* of authors; often rooting at the extremity, like the principal stem. Leaves rather crowded, all more or less secund, pointing downwards, ovate-acuminate, denticulate, papillose at the back; margin plane; nerve variable, usually forked and very short, sometimes single, broad and extending half-way up the leaf; marginal areolæ quadrate, smaller than in the preceding; central areolæ longer and less opaque. Perichætial leaves suberect, lanceolate-acuminate. Fruitstalk ½ inch long, smooth. Capsule oblong, cernuous, very slightly curved. Lid rostrate, almost as long as the capsule. Peristome as in *Hypnum.* Calyptra whitish, dimidiate. Inflorescence dioicous.

In habit this moss approaches to that of *Pterogonium filiforme*, and to *P. gracile* of Hedwig, and presents considerable analogy to *Isothecium myosuroides*, but has certainly the closest affinity with *Hypnum dimorphum;* for which reason we place it here, rather than with *H. catenulatum* of Schwaegrichen.

*** Leaves roundish, rather obtuse, entire, two-nerved, or nerveless.

§ *Alpestria.*

378. 44. *Hypnum palustre* Dill., Linn. (*marsh Feather-Moss*); monoicous; stem creeping; branches suberect, crowded, simple, curved, cuspidate at the apex; leaves more or less secund (sometimes imbricated), spreading, elliptical, apiculate, concave, entire, two-nerved at the base, singly nerved half-way, or nerveless; perichætial leaves striated, erect; capsule ovate, cernuous; lid conical. (Tab. XXVI.)

Limnobium palustre *Bryol. Eur.*

Hypnum palustre *Linn.* Sp. Pl. 1593. *Dill.* Musc. t. 37. f. 27. A., and t. 40. f. 44. D., according to *Hooker and Arnott. Turner. Smith*, Eng. Bot. t. 1655. *Schwaegr. Funck*, Deutsch. Moose, t. 50. n. 70. *Hook. and Tayl. Bridel.*

Hypnum luridum, *Hedwig*, St. Crypt. iv. t. 38. *Swartz*, Musc. Suec. p. 58. (*Leaves nerveless.*)

Hypnum fluviatile *Turner*, Musc. Hib. p. 192. *Smith*, Eng. Bot. t. 1303. (not of *Hedwig*). (*Leaves more or less nerved.*)

Hypnum lætevirens *Turner*, Musc. Hib. p. 149. t. 13. fig. b. e. (not of *Smith*, nor of Eng. Bot.).

var. β. leaves imbricated, not secund.

H. adnatum *Turner*, Musc. Hib. p. 165. *Smith*, Eng. Bot. t. 2406. (not of *Hedwig*).

H. neglectum *Bridel*, Bryol. Univ. ii. 564. ?

var. γ. subsphæricarpon; leaves strongly nerved almost to the summit; capsule tumid, roundish-ovate.

H. subsphæricarpon *Haller. Schwaegrichen. Schleicher. Funck*, Deutsch. Moose, t. 53. n. 84. *Bridel.*

H. fluviatile, var. ramis solito duplo crassioribus, *Turner*, Musc. Hib. p. 192.

H. fontinaloides *G. Donn MSS.* in Herb. Smith.

Hab. On stones, and on rocks in rivulets. Var. β. on rocks near waterfalls. Turk Cascade, near Killarney. Near Aber, N. Wales. Near Ambleside. Var. γ. Helk's Wood, near Ingleton, Yorkshire, *W. Wilson.* Pentland Hills, *Dr. Greville.* Near Carrickfergus, *Rev. C. A. Johns.* Fr. May.

Stem creeping; branches erect, somewhat curved, about $\frac{1}{3}$ inch long, simple, the terminal foliage convolute and cuspidate. Leaves more or less spreading, usually secund, sometimes almost falcate; sometimes imbricated, erecto-patent, and not secund; concave, entire, bluntish or apiculate, widely elliptical when flattened; nerve variable according to the locality, and often (in the same individual) either double at the base of the leaf, or single and reaching more than halfway; in some localities the leaf is nerveless; areolæ narrow, linear; colour varying from bright green to brownish or lurid. Perichætial leaves evidently striated, erect. Fruitstalk $\frac{1}{2}$ inch long, smooth. Capsule ovate, cernuous, curved, sometimes short and roundish. Lid conical, more or less pointed.

This species, when the leaves are secund and two-nerved at the base, or with a short single nerve, is easily recognised; but some varieties occur with leaves not at all secund, and the nerve in others is absent; in others it extends nearly to the apex of the leaf. Two remarkable states occur at Turk Cascade, near Killarney; one of these, sent by Sir Thomas Gage to Mr. Turner (first found by Mr. Mackay, and thought new), has the leaves very much secund and quite nerveless: when sent to Dr. Swartz, he did not recognise it: the other has leaves mostly imbricated and directed every way, with an occasional branch or two bearing secund leaves: this we believe to be *H. neglectum* of Bridel: another variety, found near Aber, N. Wales, with very broad leaves, has been mistaken for *H. molle*, which indeed it very much resembles. *H. palustre* may always be distinguished from *H. molle* by its narrower, *elliptical*, apiculate leaves, of firmer texture, quite entire in the margin, and of so great a degree of concavity that they cannot be flattened without previous laceration. This species was very imperfectly known to Dr. Swartz, and he confounded it with *H. fluviatile*.

H. adnatum of Hedwig, with which *H. palustre* was confounded in *Musc. Hib.*, is a much smaller American species, with differently shaped leaves; not found in Ireland nor in Britain.

The nerveless state of the species is the *H. palustre* of Smith and of Turner, and the nerved state is their *H. fluviatile*: when the leaves are not evidently secund it becomes their *H. adnatum*.

9. 45. *Hypnum molle* Dickson (*soft water Feather-Moss*); monoicous; stem procumbent; branches simple, erect or procumbent, rather obtuse; leaves widely spreading, subsecund, roundish-apiculate, flaccid, subdenticulate, distinctly two-nerved half-way; capsule ovate, cernuous; lid conical. (Tab. XXIV.)

Limnobium molle *Bryol. Eur.*

Hypnum molle *Dicks.* Crypt. Fasc. 2. t. 5. f. 8. (the leaf at fig. *c.* incorrect as to the nerve). *Hedw.* Sp. Musc.

t. 70. (fig. not very good). *Smith,* Eng. Bot. t. 1992. (fig. of the magnified leaves nearly correct). *Funck,* Deutsch. Moose, t. 40. n. 18. *Moug. and Nestl.* n. 730. *Schwaegr. Web. and Mohr. Greville,* Scot. Crypt. Fl. t. 283. (fig. very good). *Hook. and Tayl. Bridel.*
var. β. heteromallum ; leaves lurid green, wider, secund.

Hab. On stones in alpine rivulets ; not common ; seldom in fruit. Ben Challum, Ben Nevis. In the Loch Brandy stream, Clova, *Mr. W. Gardiner.* Not found in Wales. Fr. June.

A more robust species than *H. palustre*, with longer, thicker, and more obtuse branches, and larger and flaccid foliage. Branches 1 inch long and more, slightly curved. Leaves twice as wide as in *H. palustre*, roundish-apiculate, flattish, very minutely denticulate, more or less secund ; the two nerves very distinct, reaching half-way up the leaf ; areolæ narrow, elongated ; colour yellow in Mr. Dickson's and in the Ben Nevis specimens, in other cases brownish or lurid green. Fruitstalk smooth, ½ inch long. Capsule ovate, cernuous, curved. Lid conical. Inflorescence monoicous.

Closely allied to the preceding, and also to *H. alpestre* of Swartz, which is distinct from *H. alpestre* of Greville and of Hook. and Tayl. Specimens of the true *H. alpestre*, from Wahlenberg and Sommerfelt, in the Hookerian Herbarium, have the leaves loosely imbricated, spreading, *elliptical, very concave, with reflexed points ;* nerve usually double, reaching half-way up the leaf ; sometimes single, in which state it is represented in *Hedwig*, *Sp. Musc.* t. 64. Barren specimens of *H. alpestre* are given in most of the copies of Drummond's *Musci Americani*, No. 211., as "*H. trifarium*," which it much resembles in general aspect. It is, however, intermediate between *H. palustre* and *H. molle*, with similar fructification and inflorescence.

Hypnum molle varies with dark green secund foliage : in this state the leaves are wider and more flaccid than in the typical form of the species : it is probably the var. *β. heteromallum* of Bridel, *Br. Un.* ii. 571. *H. rupestre* of Schleicher belongs to this species.

380. 46. *Hypnum arcticum* Sommerfelt (*Arctic Feather-Moss*) ; monoicous ; stem creeping ; branches erect or procumbent, elongated, simple, obtuse ; leaves widely spreading, roundish, subacute, entire, doubly nerved half-way ; capsule ovate, cernuous ; lid conical. (Tab. LVI.)

Limnobium arcticum *Bryol. Eur.*
Hypnum arcticum *Sommerfelt.*
Hypnum alpestre *Greville*, Scot. Crypt. Fl. t. 282. (not of *Swartz*, Musc. Suec. t. 6. f. 15., nor of *Wahlenb.*, nor *Hedwig* ; see Tab. LVI.) *Hook.* Brit. Flora, p. 79.
H. molle (partly) *Hook. and Tayl.*

Hab. Alpine rivulets. Ben Challum, Perthshire, *Dr. Greville.* Ben Lawers, *Mr. G. J. Lyon.* Clova Mountains, *Mr. Croall.* Fr. June.

Branches crowded, almost simple, 1 or 2 inches long, or more, with reddish or yellowish-brown foliage. Leaves widely spreading, scarcely secund, smaller than in *H. molle*, of firmer texture and more obtuse, with thicker, longer, and more opaque nerves, often blended into one, when the leaf appears to have a long, thick, single nerve extending above half-way up the leaf, as represented in Dr. Greville's excellent figure; areolæ oblong or oval. Fruitstalk, capsule, and lid, almost as in the preceding species.

§§ *Straminea.*

81. 47. ***Hypnum trifarium*** Web. and Mohr (*three-ranked Feather-Moss*); dioicous (?); stem erect or procumbent, elongated, sparingly branched; leaves compactly imbricated, often trifarious, roundish, obtuse, very concave, entire, nerved almost to the apex; capsule ovate-oblong, cernuous; lid conical. (TAB. XXXIV.)

Hypnum trifarium *Web. and Mohr*, Bot. Tasch. p. 319. Iter. Suec. t. 2. f. 2. a—d. *Hook. and Tayl. Bridel. Greville*, Scot. Crypt. Fl. t. 279.
Hypnum stramineum β. *Schwaegr.* Suppl. t. 89. *Wahlenb.*
H. illecebrum *Schultz.*
H. uliginosum *and* spirale *Schleicher*, according to *Bridel.*

Hab. Alpine bogs and rills where the soil is turfy. At the head of Glen Lochy, barren, *Greville and Hooker.* Below the summit of Craig Challeach, Perthshire. Ben Nevis, *Dr. J. D. Hooker.* Whittlesea Mere, Huntingdonshire, *Rev. M. C. Berkeley.* All barren. Fr. June?

Stems about 3 inches long, simple or sparingly branched, filiform, (with the foliage) often spirally triangular, when dry very fragile. Leaves often distinctly trifarious, but 5 or 8-ranked in other parts of the same stem, closely imbricated, very concave or inflated, entire, obtuse; the nerve ceasing not far below the apex. Perichætial leaves erect. Fruitstalk smooth, 1 inch long or more, reddish. Capsule ovate-oblong, curved, cernuous, somewhat apophysate at the base. Lid conical.

This resembles *H. stramineum;* and has by many been considered as only a local variety, with broader leaves and more robust stems. Myrin, however, contends that they are truly distinct species. He says that both species grow in the same bog near Upsal, in Sweden; *H. stramineum* growing amongst *Sphagnum*, and bearing fruit plentifully; *H. trifarium* growing in water, and rarely fructifying.

82. 48. ***Hypnum stramineum*** Dickson (*straw-like Feather-Moss*); dioicous; stem erect, filiform, sparingly branched, branches erect; leaves imbricated, erecto-patent, elliptical, obtuse, concave, entire, nerved almost to the apex; capsule ovate, cernuous; lid conical. (TAB. LVI.)

Hypnum stramineum *Dicks.* Crypt. Fasc. 1. t. 1. f. 9. *Turner. Smith*, Eng. Bot. t. 2465. *Web. and Mohr. Schwaegr. Moug. and Nestler*, n. 516. partly. *Funck*, Deutsch. M. t. 38. n. 9. *Hook. and Tayl. Bridel.*
Hypnum longiflorum *Bridel*, Meth.

Hab. In marshes, amongst *Sphagnum;* rare in fruit. In fruit at Stanfield Moor, near Todmorden, *John Nowell.* Stayley

Brushes, near Manchester, *Jethro Tinker.* Near Prestwich, Lancashire, *John Horsfield.* Near Forfar, Scotland, *Mr. T. Drummond.* Near Falkirk, *Mr. T. Lyle.* Abundant, but barren, on the Breadalbane Mountains. In fruit, on sandy banks of the river at Castle Kelly Glen, near Dublin, *Dr. Taylor.* West side of Hampstead Heath, *Dillenius.* Delamere Forest, Cheshire. Fr. May.

Stems 2—4 inches long, filiform, weak and slender, sparingly branched. Leaves narrower than in the last and less inflated, elliptic or elliptic-oblong, obtuse, concave, entire, thinly nerved almost to the summit; areolæ narrow, elongated, those at the base larger and pellucid; colour pale or yellowish-green. Perichætial leaves erect, thrice as long as the stem leaves. Fruitstalk smooth, 1 or 2 inches long, or more. Capsule rather small, curved, cernuous, pale reddish-brown. Lid conical, short. Inflorescence dioicous. Calyptra yellowish, longer than the capsule.

The slender habit of this moss, which is not brittle when dry, will distinguish it from *H. trifarium* and the allied species.

383. 49. *Hypnum sarmentosum* Wahlenb. (*twiggy Feather-Moss*); dioicous (?); stems prostrate, subpinnate; branches short, cuspidate; leaves crowded, erecto-patent, elliptic-oblong, bluntish, concave, nerved almost to the apex, reticulated at the base. (Tab. LVI.)

Hypnum sarmentosum *Wahlenb.*
H. cordifolium, purple alpine variety, *Hook. and Tayl.*

Hab. On wet alpine rocks. Brandon Mountain, Ireland, *Dr. Taylor,* and *W. Wilson.* Head of Can Lochan, Scotland, *Mr. W. Gardiner.* Between Kenmare and Killarney, *Dr. Taylor.* Near Killin, Perthshire, and Carnedd Llewelyn, N. Wales, *W. Wilson.* Fruit found in Norway by Hübener: vid. C. Müller, Syn. Musc. 2. 380. Fr. Spring?

Intermediate in size and general character between *H. stramineum* and *H. cordifolium;* the stems always procumbent, and more or less pinnate, with numerous short cuspidate branches; the foliage always purple, or deep red. Leaves much crowded, longer and narrower than those of *H. stramineum;* in the Welsh specimens lanceolate-ligulate and somewhat twisted; concave, subacute, with a very small point; areolæ narrow and elongated, large and pellucid at the base, as in *H. stramineum.* Capsule and fruitstalk as in *H. trifarium* (*C. Müller*). Lid not known. Inflorescence probably dioicous, as in that species; for, in a specimen with slender flagelliform branches, gathered in Greenland by M. Giseke, given by Dr. Taylor as "*H. sarmentosum* Wahlenb. passing into *H. stramineum,*" we find only barren flowers. If not a distinct species, it ought to be united to *H. stramineum,* and not to *H. cordifolium.*

384. 50. *Hypnum cordifolium* Swartz, Hedw. (*heart-leaved Feather-Moss*); monoicous; stem erect, subpinnate; branches spreading, or erect, attenuated; leaves loosely imbricated, spreading, cordate-ovate, obtuse, concave, entire, nerved almost to the apex; capsule oblong, horizontally cernuous; lid conical. (Tab. LVI.)

Hypnum cordifolium *Hedw.* St. Crypt. iv. t. 37. *Swartz,* Musc. Suec. p. 62. *Smith,* Eng. Bot. t. 1447. *Moug. and Nestl.* n. 518. *Funck,* Deutsch. M. t. 41. n. 23. *Schwaegr. Web. and Mohr. Hook. and Tayl. Bridel.*
H. cuspidatum β. bicolor *Turn.* Musc. Hib.
H. phyllorhizans *P. Beauv.*
H. fontanum *Schleich.*
H. crassum *Schuhmach?*
H. squarrulosum *Bridel.*
H. aquaticum *Turner MSS.* in Herb. Turner.

Hab. Marshes and ditches. Fr. April, May.

Stems 3—6 inches long, and more, the terminal foliage convolute and somewhat cuspidate; branches short, slender. Leaves spreading, almost squarrose, lax, distant, cordate-ovate, concave, entire, more or less obtuse, sometimes minutely apiculate, nerved as in *H. stramineum;* the areolæ narrow and elongated, not sensibly enlarged at the base. Perichætial leaves erect, long. Fruitstalk often very long, smooth. Capsule oblong, horizontal, suddenly bent from the fruitstalk; not tapering at the base like that of *H. cuspidatum.* Lid conico-convex, pointed. Inflorescence monoicous.

Easily distinguished from *H. cuspidatum* by the nerved leaves; and from *H. stramineum* by the more robust habit, and lax, spreading, cordate leaves.

B. Stem pinnate, not villous, erect; fruitstalks from the upper part of the stem; inflorescence dioicous.

* Leaves nerveless, or two-nerved at the base, entire.

25. 51. *Hypnum cuspidatum* Dill., Linn. (*pointed Bog Feather-Moss*); stem suberect, simply pinnate; branches and stem cuspidate; leaves spreading, at first convolute, ovate, obtuse, entire, nerveless, or two-nerved at the base; perichætial leaves erect, striated; capsule much curved, cernuous, tapering at the base; lid conical. (TAB. XXVI.)

Hypnum cuspidatum *Linn.* Sp. Pl. 1595. *Dill.* Musc. t. 39. f. 34. *Hedwig,* Sp. Musc. *Turner,* Musc. Hib. p. 177. (excl. var. β.) *Smith,* Eng. Bot. t. 2407. *Moug. and Nestl.* n. 227. *Funck,* Deutsch. M. t. 41. n. 22. *Schwaegr. Web. and Mohr. Hook. and Tayl. Bridel* (Stereodon).
H. flexile *Brid.* Meth.

Hab. In marshes, frequent. Fr. May, June.

Stems 4—6 inches long, more or less erect, pinnate, with the terminal foliage remarkably cuspidate; branches simple, spreading, also cuspidate. Leaves ultimately spreading, almost squarrose; at first erect, appressed and convolute, the upper part always incurved in the margin; light yellowish-green and glossy, ovate or almost elliptical, obtuse or very obscurely pointed, generally lacerated or cloven at the apex, entire; margin plane; areolæ narrow, except at the base, where they are very large and pellucid. Perichætial leaves very long, erect, striated. Fruitstalk long, smooth. Capsule oblong, arcuate and cernuous, gradually tapering into the fruitstalk; the upper or gibbous part red; the lower green, turning yellow when fully ripe. Lid conical, acute. Inflorescence dioicous.

The nerveless leaves distinguish this from the preceding species; as also the singularly shaped party-coloured capsules, and striated perichætium.

386. 52. *Hypnum Schreberi* Dill., Willd. (*Schreber's Feather-Moss*); stem erect, simply pinnate; branches slender, curved; leaves imbricated, suberect, elliptical, obtuse, concave, entire, two-nerved at the base; perichætial leaves erect, smooth; capsule ovate-oblong, curved, cernuous; lid conical. (Tab. XXIV.)

Hypnum Schreberi *Willd.* Fl. Berol. p. 325. *Dill.* Musc. t. 40. f. 47. *Dickson. Turner. Smith,* Eng. Bot. t. 1621. *Funck,* Deutsch. M. t. 40. n. 20. *Schwaegr. Hook. and Tayl. Bridel.*
H. compressum *Schreb. Hoffm.* &c.
H. muticum *Swartz.*
H. parietinum *Herb. Linn.* Fl. Suec. n. 1020. Fl. Lapp. n. 406. *Wahlenb.*
H. cuspidatum β. inerme *Weiss.*
H. inerme *Schrank.*
H. purum *Ehrh.*
H. curlandicum *Brid.* Meth.

Hab. Woods and shady banks; rare in fruit. Cheshire, *W. Wilson.* Lancashire, *John Nowell.* Yorkshire, *Mr. Spruce,* in fruit; but in very few localities. Fr. Oct., Nov.

Stems 4—6 inches long, red, with shining yellowish-green or fulvous foliage, pinnate, somewhat cuspidate at the apex; branches slender, curved or drooping; attenuated and sometimes rooting at the extremity. Leaves at first convolute, at length erecto-patent, closely imbricated, concave, obtuse, entire; margin reflexed at the base, elsewhere plane; areolæ narrow, larger at the base. Perichætial leaves erect, not at all striated. Fruitstalk smooth, one inch long, or more. Capsule smaller than in the last, horizontally cernuous, curved; not tapering at the base. Lid short, conical. Inflorescence dioicous.

This species is distinguished from *H. purum* by the almost nerveless, obtuse leaves; and by the differently shaped capsule. It much resembles *Entodon Montagnei* in habit and foliage: the leaves however are more obtuse, somewhat reflexed at the point; and the stems are deep red, beautifully contrasting with the yellowish semi-transparent foliage: they differ essentially in the form of the capsule, and in the structure of the peristome.

** Leaves nerved half-way, obtuse, entire.

387. 53. *Hypnum purum* Dill., Linn. (*neat meadow Feather-Moss*); stem erect, simply pinnate; branches round, slightly curved; leaves closely imbricated, roundish or oval, with small

recurved points, very concave, entire, nerved half-way; capsule ovate, horizontal; lid conical. (TAB. XXIV.)

Hypnum purum *Linn.* Sp. Pl. 1594. *Dill.* Musc. t. 40. f. 45, 46. A. B. *Hedw.* Sp. Musc. t. 66. *Turner. Smith,* Eng. Bot. t. 1599. *Moug. and Nestl.* n. 44. *Funck,* Deutsch. M. t. 40. n. 19. *Schwaegr. Web. and Mohr. Hook. and Tayl.*

Hypnum illecebrum *Swartz. Smith,* Eng. Bot. t. 2189. f. 2. (not of *Schwaegrichen,* nor of *Hedw.*).

H. purum *β.* illecebrum *Bridel,* Bryol. Univ.

Hab. On shady banks; not common in fruit; but more frequently so than the preceding species. Fr. Oct., Nov.

Stems of softer texture than the last, not coloured, more robust, with more tumid and inflated foliage, obtuse not cuspidate at the apex, pinnate; branches crowded, obtuse. Leaves widely elliptical, very concave with recurved points, closely imbricated, erecto-patent, pale green, glossy, membranous, entire; the nerve reaching half-way, and sometimes nearly to the apex; margin recurved at the base, elsewhere plane; areolæ narrow, larger at the base. Perichætial leaves erect. Fruitstalk smooth, succulent, brittle, about an inch long. Capsule small, ovate, horizontally cernuous; suddenly bent from the top of the fruitstalk like the bowl of a tobacco-pipe, pale brown. Lid conical, rather obtuse. Inflorescence dioicous.

The soft, clean, and tender stems are commemorated by Dillenius, as used by anglers in Lancashire to cleanse worms, and known there by the name of *Stag's Horn Moss.* A small barren state, with less regularly pinnate stems, appears to have been confounded by Swartz, Turner, and Smith, with the true *Hypnum illecebrum* of Schwaegrichen, and with *H. illecebrum* Hedw. The moss figured in *Eng. Bot.* t. 2189. f. 1. (probably from Mr. Lyell's specimen), and the magnified leaves (which are serrated), appear to belong to *H. illecebrum* Schwaegr.; but f. 2. is certainly *H. purum.* The report given by Dr. Arnott (in *Muscol. Brit.* ed. 2. p. 176.), stating that *H. illecebrum* Hedw., *Sp. Musc.* t. 66. (which is *H. Boscii* Schwaegr. with smooth fruitstalk and rostrate lid), has been found in Scotland, has not been confirmed; and a similar report of its having been gathered in Miller's Dale, near Buxton, Derbyshire, rests upon very insufficient evidence.

C. Stem pinnate or bipinnate, erect; tomentous with branched fibres (*villi*) amongst the leaves; fructification from the upper part of the stem.

§ 1. Stem simply pinnate. *Abietina.*

78. 54. *Hypnum abietinum* Dill., Linn. (*Spruce-tree Feather-Moss*); dioicous; stem erect, rigid, simply pinnate, clothed with short villi; branches attenuated; leaves closely imbricated, erecto-patent, subsecund, ovate-acuminate, subplicate, papillose, margin reflexed; nerve continued almost to the apex; capsule subcylindrical, cernuous; lid conical. (TAB. XXV.)

Thuidium abietinum *Bryol. Eur.*

Hypnum abietinum *Linn.* Sp. Pl. 1591. *Dill.* Musc. t. 35.

f. 17. *Hedw.* St. Crypt. iv. t. 32. *Turner.* *Smith,* Fl. Brit. 1301. (partly), Eng. Bot. t. 2037. (except the fruited specimen, which is *H. Blandovii*). *Mougeot and Nestler,* n. 226. *Funck,* Deutsch. Moose, t. 41. n. 25. *Schwaegr.* *Web. and Mohr.* *Hook. and Tayl.* (partly). *Bridel* (not *Swartz*). *Drummond,* Musc. Amer. n. 216.

Hab. On alpine rocks, chalk hills, and on sandy ground near the sea. Breadalbane mountains, Scotland. Sands of Barry, near Dundee, *Mr. Drummond.* Kent, *Sir. J. E. Smith.* Hills behind Hincksey, near Oxford (see *Dillenius* Musc. p. 281.). Box Hill, Surrey, and Barton, Suffolk (barren), *W. Borrer, Esq.* Fr. Spring ?

Stems rigid, reddish, 2—4 inches long or more, often forked or subdivided, erect or decumbent, pinnate, covered with very short branched villi; branches crowded, slightly recurved or drooping. Leaves crowded, suberect, more or less secund, appressed when dry, yellowish, not at all glossy, papillose at the back, and especially so on the keel or nerve; stem-leaves ovate or cordate, acuminate, serrulate towards the apex, more or less plicate; margin recurved below; branch-leaves narrower, less evidently plicate; nerve ceasing below the apex, often reddish; areolæ small, dot-like. Perichætial leaves erect, striated, pale yellow, glossy. Fruitstalk smooth, about 1 inch long, reddish. Capsule oblong, arcuate, cernuous, pale brown. Lid conical. Calyptra yellowish. Inflorescence dioicous.

This species is very rare in fruit; and Necker, to support his hypothesis, has ventured to assert that it never produces capsules. The fertile specimens under this name, in the Linnæan Herbarium, belong to *H. Blandovii;* but genuine specimens, in fine fruit, are given in Drummond's *Musci Americani;* and it has sometimes been found in that state in Europe. Dillenius did not know the fruit: his specimen is barren. This species has often been confounded with *H. Blandovii,* which, however, is very distinct.

389. 55. *Hypnum Blandovii* Web. and Mohr (*Blandow's Feather-Moss*); monoicous; stem erect, simply pinnate, copiously villous; branches attenuated; leaves loosely imbricated, spreading at the base, erect above, broadly ovate or subcordate, acute, sharply keeled, serrulate, nerved almost to the apex, margin recurved; capsule oblong, curved, cernuous; lid conical, (TAB. XXV.)

Thuidium Blandowii *Bryol. Eur.*

Hypnum Blandovii *Web. and Mohr,* Bot. Tasch. p. 332. *Röhling.* *Schwaegr.* Suppl. t. 142. *Sturm,* Deutsch. Fl. (with a figure). *Funck,* Deutsch. M. t. 41. n. 26. *Hook. and Tayl.* *Bridel.* *Hook.* Br. Fl. *Wilson,* in Eng. Bot. Suppl. t. 2760. (as *H. laricinum*).

H. laricinum *Wilson, MSS.* in *Hook.* Br. Fl. p. 87.

H. abietinum *Swartz,* Musc. Suec. p. 54. *Wahlenberg?* *Smith,* Fl. Brit. (partly), Eng. Bot. t. 2037., as to the specimen in fruit from *Swartz,* and the magnified leaf on the right hand.

H. affine *Crom.*

Hab. In bogs, rare. Tonbridge, Kent, *Mr. Joseph Woods* (barren). Knutsford Moor, Cheshire, plentifully in fruit, May, 1832, *W. Wilson.* Bog near Terrington Carr, Yorkshire, *Mr. Spruce.* Fr. May.

Stems rather loosely tufted, about 3 inches long, more or less erect, pinnate, flexible, not rigid; densely clothed with long, branched, jointed villi. Branches slender, crowded, spreading; lower ones drooping, attenuated, and rooting at the extremity. Leaves loosely imbricated in five rows; widely spreading out from the point of insertion at the base, the upper part erect or incurved; sharply keeled, or compresso-carinate at the back; broadly ovate and subcordate, but curiously ciliated and narrowed at the base so as to appear almost pedicellate; not amplexicaul, acute or somewhat acuminate, serrulate, papillose at the back; except on the keel, which is smooth; glossy when dry, and somewhat crisped or twisted, not appressed; margin recurved almost to the apex; texture thin and membranous; areolæ oblong, subhexagonal; nerve thin, reaching almost to the apex; colour of the foliage yellowish-green. Perichætial leaves erect, substriate. Fruitstalk 2 inches long, or more, reddish, smooth. Capsule oblong, curved, cernuous, pale brown. Lid conical, pointed. Inflorescence monoicous.

Essentially different from *H. abietinum* in the inflorescence; and in the form, texture, and direction of the leaves.

§ 2. Stem doubly or triply pinnate. *Tamariscina.*

* Leaves papillose, nerved almost to the apex.

90. 56. *Hypnum delicatulum* Linn. (*delicate Feather-Moss*); dioicous; stem erect, or decumbent, bipinnate, clothed with branched villi; branches attenuated, drooping, often rooting at the extremity; leaves cordate-acuminate, substriated, muriculate, nerved almost to the apex; capsule subcylindrical, curved, cernuous; lid conical-acuminate. (TAB. LVII.)

Thuidium delicatulum *Bryol. Eur.*

Hypnum recognitum *Hedw.* St. Crypt. iv. t. 35. *Roth. Smith*, Eng. Bot. t. 1495. *Moug. and Nestl.* n. 1031.

H. delicatulum *Lin.* Sp. Pl. p. 1590. *Schwaegr.* Suppl. i. 2. p. 236. (as to the European specimens only); not of *Hedwig*, St. Crypt. iv. t. 33. *Schultz. Funck*, Deutsch. Moose, t. 42. n. 28.

H. proliferum var. *Hook. and Tayl. Drummond*, Musc. Amer. No. 214. (some of the specimens).

H. tamariscinum *C. Müller*, Synops. Musc. ii. 483.

H. tamariscinum *β. Bridel.*

Hab. On limestone rocks and chalk hills, with *H. tamariscinum.* Romantic Rocks at Matlock Bath, 1790, and again in July, 1820, with perfect fruit, *Sir J. E. Smith* (Herb. Smith). Helk's Wood, near Ingleton, Yorkshire, July 1838, *W. Wilson.* Sussex (barren), *M. Mitten.* Cheltenham, *Mr. C. Prentice.* Near Airth, Scotland, *Mr. Lyle.*

Fr. July, August.

Stems elongated, not interruptedly proliferous as in the next species, everywhere pinnate, forming a narrow oblong frond. Branched villi more conspicuous. Branches short, crowded, attenuated, often recurved and rooting at the extremity. Leaves widely ovate-acuminate, or cordate; evidently and sharply papillose or muricated at the back, and crested on the keel, yellowish-green; stem-leaves somewhat plicate, reflexed in the margin; nerve ceasing very near the apex, which is minutely toothed. Perichætial leaves erect, pale, lanceolate, entire, not fringed. Fruitstalk 1 inch long or more, smooth, pale reddish. Capsule pale brown, curved, oblong. Lid conical-acuminate, half as long as the capsule. Calyptra yellowish. Inflorescence dioicous.

This species is certainly distinct from *H. tamariscinum;* and may be recognised by the ramification and different mode of growth, as well as by the short (not rostrate) lid; also by the pale-brown (not purplish-red) capsules; by the more acute and papillose leaves, and by the paler (often yellowish or fulvous) hue of the foliage. It ripens its fruit at a very different season. Schwaegrichen has improperly confounded it with *H. delicatulum* of Hedwig, an American species, of which Hedwig, and consequently Schwaegrichen, knew very little; Hedwig's figure having been chiefly borrowed from Dillenius, *Musc.* t. 83. f. 6.

H. delicatulum, in consequence of its resemblance to *H. Blandovii*, has been substituted for it in some copies of Drummond's *Musci Americani.*

391. 57. *Hypnum tamariscinum* Hedw. (*Tamarisk Feather-Moss*); dioicous; stem arched, interruptedly tripinnate, with short branched villi; stem-leaves cordate-acuminate, subplicate; branch-leaves ovate, rather obtuse, all of them papillose, nerved almost to the apex; perichætial leaves fringed; capsule subcylindrical, curved, cernuous; lid with a long beak. (Tab. LVII.)

- Thuidium tamariscinum *Bryol. Europ.*
- Hypnum tamariscinum *Hedw.* Sp. Musc. t. 67. *Schwaegr. Web. and Mohr. Funck,* Deutsch. M. t. 42. n. 29. *Moug. and Nestl.* n. 41. *Bridel. Dill.* Musc. t. 35. f. 14.
- H. proliferum *Linn.* Sp. Pl. p. 1590. *Hoffm. Swartz,* Musc. Suec. *Smith,* Eng. Bot. t. 1494. *Turner. Hook. and Tayl.* t. xxv.
- H. parietinum *Willd.*
- H. delicatulum *C. Müller,* Syn. Musc. ii. 484.

Hab. Woods and banks, frequent; not common in fruit.

Fr. Nov.

Stems erect below, arched above; sometimes flagelliform or rooting at the extremity; proliferous with innovations, the lower parts of which and of the stem are bare of branches; the upper portion of the stem densely tripinnate, forming an ovate-oblong frond. Branches slender, not rooting at the extremity. Stem-leaves intermixed with branched villi; less acute than in the next species; branch-leaves rather obtuse, all of them less papillose than in the next, with a shorter nerve; colour intense green, not at all glossy. Perichætial leaves laciniated in the margin. Fruitstalk deep red, smooth, 1 inch long. Capsule deep purplish red, arcuate, oblong. Lid rostrate, above half as long as the capsule. Calyptra whitish. Teeth of the peristome shorter than in *H. delicatulum;* inner peristome paler.

The name *tamariscinum* appears to have been deliberately substituted by Hedwig for the Linnæan name *proliferum;* probably on account of the confused synonymy of this and of *H. splendens.* We concur with the critical remarks in *Bryol. Europ.*, as to the impropriety of interchange of the names of this and of the preceding species, in the *Synops. Musc.* of C. Müller.

** Leaves smooth, two-nerved at the base.

92. 58. *Hypnum splendens* Dill., Sibth. (*glittering Feather-Moss*); dioicous; stem suberect, interruptedly bi-tripinnate, villous; leaves imbricated, broadly ovate or elliptical, those of the stem cirrhoso-acuminate, all of them concave, serrated, two-nerved at the base, margin recurved below; capsule ovate, cernuous; lid rostrate. (TAB. XXV.)

Hylocomium splendens *Bryol. Eur.*

Hypnum splendens *Hedw.* Sp. Musc. t. 67. f. 6—9. *Turner. Smith*, Eng. Bot. t. 1424. *Moug. and Nestl.* n. 42. *Funck,* Deutsch. M. t. 42. n. 3. *Schwaegr. Web. and Mohr. Hook. and Tayl. Bridel. Dill.* Musc. t. 35. f. 13.

Hypnum parietinum *Linn.* Syst. Plant. p. 1590. *Swartz* Musc. Suec. *Hoffm.* &c.

Hab. On grassy banks, in woods, &c.; frequent, but not common in fruit. Fr. April.

Stems 2—6 inches in length, sometimes longer, erect or procumbent, proliferous as in the last, and hence interruptedly bi-tripinnate, clothed with branched villi, reddish, covered with yellowish or fulvous-green shining membranous foliage. Stem-leaves very glossy, roundish-elliptical with long wavy points; at first erect and appressed; branch-leaves with a short point, or muticous; all of them imbricated, erecto-patent, concave, serrated, distinctly two-nerved, smooth, not papillose, membranous; areolæ narrow, elongated. Perichætial leaves convolute, smooth. Fruitstalk smooth, reddish, about 1 inch long. Capsule ovate, curved, cernuous, shorter than in the preceding species. Lid rostrate, as long as the capsule. Inflorescence dioicous.

This species, in the form and structure of the leaf and in the short capsule, is nearly allied to the next group; and connects them with the preceding species with villous stems. It grows to a large size in California, and on the Columbia River, with branches 1½ inch long. Beautiful and instructive specimens of a small variety of this species (*var. β. interruptum* Bridel), gathered at Albany, New York, by E. Beck, Esq., have the stems composed of six successive innovations, the growth of as many seasons; the whole stem scarcely 4 inches in height; the naked or erect portion of each innovation ½ inch long; the distance between the points of insertion of each new growth about ¾ inch; the branched part of each innovation forming an ovato-triangular, nearly horizontal or arcuate frond; about five of the branches being below the point of insertion of the next innovation, and the rest of the branches, with the perichætia or perigonia, above that point, which appears in general to alternate right and left in the successive fronds, though no absolute order is observed. The fruitstalks in this variety are very short; varying from $\frac{1}{3}$ inch to $\frac{1}{2}$ inch or rather more, much curved at the top; so that the capsules, which occur on two of the upper innovations, are quite drooping or pendulous. The uppermost innovation in the specimens is only half developed; the one immediately below it is fully expanded, and bears (in the fertile specimens) fertile flowers only in the earliest stage; the next preceding growth has capsules fully ripened and divested of the lids; the next below has old capsules; the next has remains of fruitstalks; and the lowest of all has old perichætia. This appears to be the normal mode of vegetation of the species, but it is rarely so evident in British specimens as in this small variety. A singular and fine species of *Hypnum*, as yet unpublished, *H. spectabile* Hook. and Wils. MSS., gathered sparingly at Nootka and Sitka by Captain Barclay, and allied to *H. splendens*, will probably be the type of an allied group: it has the innovation from near the base of the long, erect, unbranched portion of the stem, which is twice as long as the horizontal bipinnate frond at its summit. In this new species the stem-leaves are ovate-apiculate, entire, singly nerved half-way, erect, appressed, and shining; branch-leaves ovate-oblong, obtuse, serrated at the apex, plicato-striate, singly nerved nearly to the apex; fruitstalk, short, smooth; capsule ovate, arcuate, cernuous; lid conical, very acute; inflorescence dioicous; stem obscurely villous.

Hypnum splendens is quite as much proliferous as *H. tamariscinum*; and, as is proved by the numerous mistakes in the synonymy recorded by Bridel, the Linnæan definition of the species is less apposite than that of Dillenius, who has well distinguished this from the preceding by its shining foliage.

§ 3. Stem irregularly and distantly pinnate; leaves serrated, two-nerved at the base, or singly nerved half-way, plicato-striate; capsule short, roundish, with a short lid; inflorescence dioicous. *Umbrata.*

393. 59. *Hypnum umbratum* Ehrhart (*shady-rock Feather-Moss*); dioicous; stems suberect, with branched villi, irregularly bipinnate; leaves loosely imbricated, cordate-acuminate, sharply serrated, two-nerved, plicato-striate, margin reflexed; capsule roundish-obovate, cernuous; lid conical, acute. (TAB. LVII.)

Hylocomium umbratum *Bryol. Eur.*

Hypnum umbratum *Hedw.* Sp. Musc. t. 67. f. 10—12. *Schwaegr. Hoffm. Ehrh.* Crypt. Exsicc. n. 66. *Web. and Mohr. Funck,* Deutsch. Moose, t. 41. n. 27. *Mougeot and Nestler*, n. 329. *Bridel* (not of *Smith*, nor of *Turner*).

H. proliferum β. umbratum *Wahlenb.* Fl. Lapp.

Hab. Alpine woods, on stones. Amongst large stones, in a straggling birch wood, Clova Mountains, below the station for *Sonchus alpinus*, sparingly, autumn 1828. Head of White Water, Clova, *Mr. Thos. Drummond.* Glen Dole, August 1836, *W. Wilson.* Trosachs, near Callander, *Mrs. Robertson.* Fr. Nov.

Stems more or less arched, producing innovations as in *H. splendens*, but the lower unbranched part of the innovation shorter and less conspicuous. Branches long and more scattered, often simple; slender, and attenuated; branched villi long and very conspicuous. Leaves spreading, not crowded, yellowish-green, membranous, rather glossy, sharply and distinctly serrated, plicato-striate, evidently two-nerved in the lower half; areolæ narrow, elongated. Perichætial leaves serrulate, recurved at the apex. Fruitstalk 1 inch long or more, smooth. Capsule short, roundish, cernuous. Lid acutely conical. Calyptra reddish. Inflorescence dioicous.

H. umbratum has the leaves more evidently serrated than in *H. brevirostre*, and not auriculate at the base: it differs also in the shape of the lid. It is distinguished from *H. splendens* by the more simple straggling branches, plicate leaves, and conical lid.

74. 60. *Hypnum Oakesii* Sullivant (*Mr. Oakes' Feather-Moss*); dioicous; stem arched, irregularly and distantly pinnate, villous; leaves imbricated, suberect, roundish-ovate, concave, shortly acuminate, plicato-striate, sharply serrated, nerved above halfway or shortly two-nerved, margin recurved; perichætial leaves squarrose, acuminate; capsule roundish-ovate, cernuous; lid conical, with a short beak. (TAB. LVII.)

Hypnum Oakesii *Sullivant*, in *Gray's* Manual of Botany, p. 673. (1848). Mem. Americ. Acad. of Arts and Sciences, vol. iv. New Series, 1849, p. 173. tab. 5. *C. Müller*, Synops. Musc. ii. 461.
Hypnum fimbriatum *Hartmann*, Skand. Flora, ed. 5. (1849) p. 330. *C. Müller,* Syn. Musc. ii. 456.
Hylocomium fimbriatum *Bryol. Europ.*
Hypnum Pyrenaicum *Spruce*, in Ann. Nat. Hist. vol. iii. (1849), p. 129. tab. i. *C. Müller*, Syn. Musc. ii. 456.
H. brevirostre *Sommerfelt,* in Herb. Hooker.

Hab. Alpine rocks. Near the summit of Ben Lawers, growing with *H. cirrhosum,* July 1850, barren, *Mr. Lyon.* Fr. Autumn?

In habit very similar to *H. umbratum;* but more robust, and differing in the larger, more concave leaves, narrowed at the base, and mostly one-nerved; almost elliptical, not cordate, slightly plicato-striate; crowded so as to conceal the numerous branched villi, pale green, membranous, shortly acuminate, coarsely serrated above; margin strongly reflexed; areolæ rather large, rhomboid. Perichætial leaves serrated, tapering to a narrow point. Fruitstalk 1 inch long, smooth. Capsule gibbous above, short. Lid nearly as long as the capsule, conical, with a short beak. Annulus obscure. This moss may have been over looked for *Antitrichia curtipendula*, to which it bears considerable resemblance when growing.

5, 61. *Hypnum brevirostre* Ehrh. (*short-beaked Feather-Moss*); dioicous; stem erect, arched, with branched villi, irregularly bipinnate; stem-leaves widely spreading, subsquarrose, cordate, suddenly acuminated, plicato-striate; branch-leaves spreading, ovate-acuminate, striated; all of them serrulate, two-nerved at the base; capsule roundish-ovate, cernuous; lid conical, with a short inclined beak. (TAB. LVII.)

Hylocomium brevirostrum *Bryol. Eur.*

Hypnum brevirostrum *Ehrh.* Pl. Exsicc. n. 85. *Roth. Schwaegr.* Suppl. i. 2. 279. t. 225. a. *Funck,* Moos. t. 48. n. 61. *Moug. and Nestl.* n. 423. *P. Beauv. Bridel. Hook. and Tayl. Wilson,* in Eng. Bot. Suppl. t. 2865.

H. triquetrum β. minus *Hook. and Tayl.* Musc. Brit. ed. 1. p. 108. *Web. and Mohr. Röhl.* &c.

H. erectum *Raddi.*

Hab. In woods, especially in mountainous districts. Abundant near Killarney, Ireland. Cheshire. Derbyshire. N. Wales. Scotland. Fr. Oct., Nov.

Stems 2—6 inches long, with innovations; erect below and arched above, as in the last; sometimes rooting at the extremity, irregularly bipinnate; branches mostly simple and attenuated, red; branched villi smaller than in *H. umbratum.* Leaves yellowish-green, glossy; those of the stem subsquarrose, distant, more or less plicato-striate, broadly cordate, suddenly and narrowly acuminated, the base auriculate and amplexicaul; those of the branches moderately spreading, ovate and less suddenly acuminated, obscurely striated when dry; all of them closely and minutely serrated, two-nerved at the base; areolæ narrow. Perichætial leaves serrulate; attenuated and recurved at the apex, reddish. Fruitstalk about 1 inch long, smooth, red. Capsule roundish-ovate, or ventricose, shining; thin and bladdery while recent, showing the small sporangium through its walls, horizontally cernuous. Lid obliquely rostellate, half as long as the capsule, or sometimes longer. Inner peristome with very short cilia two together. Outer teeth reddish. Calyptra often reddish. Inflorescence dioicous, though Bridel says the contrary.

Hypnum brevirostre differs from *H. umbratum* in the more robust habit; in the squarrose suddenly acuminated stem-leaves, which have smaller serratures and rounded auricles at the base; and in the rostrate lid.

D. Stem pinnate, destitute of villi, more or less erect, bearing fructification in the upper part; leaves more or less squarrose, serrulate, plicato-striate below, two-nerved at the base, or nerveless; capsule mostly short, or roundish; lid conical; inflorescence dioicous.

396. 62. *Hypnum flagellare* Dickson (*thong-branched Feather-Moss*); stem arched, pinnate; branches subfasciculate, recurved; stem-leaves squarrose, cordate-acuminate, subplicate; branch-leaves spreading, subsecund, roundish-ovate, acuminate, concave, all of them sharply serrulate, two-nerved at the base; fruitstalk rough; capsule ovate-oblong, cernuous; lid conical, acute. (TAB. LVII.)

Hyocomium flagellare *Bryol. Eur.*

Hypnum flagellare *Dickson,* Crypt. Fasc. 2. p. 12. *Smith* (not of *Hedwig*). *Hooker and Taylor*, tab. xxv. *Bridel.*

Hypnum umbratum *Smith*, Eng. Bot. t. 2565. *Turner*, Musc. Hib. p. 158. (not of *Hedw.* Sp. Musc.)

Hypnum armoricum *Bridel*, Bryol. Univ. ii. 525.

Hab. Moist shady rocks by rivulets, in mountainous districts, especially near waterfalls; rare in fruit. Sefing Mountain, Co. Wicklow, *Dr. Taylor.* In fruit, plentifully, at Cromagloun Mountain, near Killarney; also by the river above Aber, N. Wales, *W. Wilson.* Near Todmorden, Lancashire, *John Nowell.* Fr. Oct., Nov.

Growing in rather dense yellowish-green patches. Stem 1 inch long or more; the lower part erect and unbranched; the upper part horizontal or arched, pinnate, producing innovations as in the preceding species, though less conspicuously so; not unfrequently subdivided, and occasionally either quite procumbent, or arched and rooting at the extremity; branches curved, drooping, attenuated. Leaves on the unbranched part of the stem squarrose, very widely cordate-acuminate, obscurely plicato-striate, serrulate; branch-leaves less widely spreading, roundish-ovate, slightly acuminate, sometimes narrowly ovate-acuminate, concave, scarcely striated when dry, sharply serrulate to the base, nerveless, or two-nerved at the base; areolæ rather narrow; colour yellowish-green, glossy when dry. Perichætial leaves suberect, attenuated, pale. Fruitstalks red, 1 inch long, rough, as in *H. rutabulum.* Capsule curved, cernuous. Lid conical, very acute. Inflorescence dioicous.

This beautiful moss is very little known on the continent; and has been much misunderstood, in consequence of its having been confounded by Smith, and Turner, with *H. umbratum* of Ehrhart; and in consequence also of the omission in *Musc. Brit.* of the important character residing in the rough fruitstalk; hence Bridel, who had not seen specimens, describes it doubtfully in the *Bryologia Universa.* It is a very distinct species when in fruit; but some barren states of this moss with narrow leaves approach to *H. molluscum.* When growing in running water, the stems and branches are much elongated; and in this state it is always barren and not easily recognised.

7. 63. *Hypnum triquetrum* Dill., Linn. (*triangular-leaved Feather-Moss*); stem erect, rigid, subpinnate; stem-leaves squarrose, striated; branch-leaves widely spreading; all of them triangular-acuminate from a cordate amplexicaul base, serrulate, two-nerved; capsule roundish-ovate, cernuous; lid conical. (TAB. XXVI.)

Hylocomium triquetrum *Bryol. Eur.*

Hypnum triquetrum *Linn.* Sp. Pl. 1589. *Dill.* Musc. t. 38. f. 28. *Turner. Smith*, Eng. Bot. t. 1622. *Schwaegr. Web. and Mohr. Moug. and Nestl.* n. 235. *Funck*, Deutsch. M. t. 48. n. 62. *Swartz. Hook. and Tayl. Bridel.*

Hab. Woods, frequent; not common in fruit. Fr. Nov.

Stem 6 inches or more in height, rigid and elastic, red, without villi, more or less evidently pinnate, often decumbent at the base.

Branches straggling, 1 inch long; often attenuated, drooping, and rooted at the extremity. Stem-leaves very much spreading, occasionally subsecund, cordate and amplexicaul at the base, thence gradually tapering and acute, minutely serrulate, plicato-striated below, the two almost parallel nerves reaching more than half-way up the leaf; areolæ narrow and elongated; branch-leaves less spreading, and scarcely striated. Perichætial leaves recurved at the summit. Fruitstalk 1 inch long or more, smooth. Capsule short, horizontally cernuous, faintly ribbed when dry, chestnut-coloured. Lid conical, more or less acute. Inflorescence dioicous, though Bridel says otherwise.

This is one of the largest species of the genus, and cannot easily be confounded with any other.

398 64. *Hypnum loreum* Dill., Linn. (*rambling mountain Feather-Moss*); stem more or less erect, elongated, less rigid, irregularly pinnate; branches attenuated, drooping; leaves squarrose, recurved, subsecund, ovate-lanceolate, acuminate, serrulate, plicato-striate below, faintly two-nerved at the base; capsule roundish-ovate; lid conical. (TAB. XXVI.)

Hylocomium loreum *Bryol. Eur.*
Hypnum loreum *Linn.* Sp. Pl. 1593. *Dill.* Musc. t. 39. f. 38. 40. *Turner. Smith,* Eng. Bot. t. 2072. *Hedwig. Schwaegr. Web. and Mohr. M. and Nestl.* n. 232. *Funck,* Moos. t. 50. n. 73. *Swartz. Hook. and Tayl. Bridel.*

Hab. In woods, especially in mountainous districts; not common in fruit. Fr. Nov.

Stems from 6 inches to 1 foot in length, less rigid and more slender than in the preceding, erect, or procumbent, more or less evidently pinnate. Branches straggling, about 1 inch long, often drooping; attenuated, and sometimes rooting at the extremity. Leaves more crowded than in the last, recurved; at the summit of the stem and on the branches always more or less secund; ovate-lanceolate, and much acuminated, not cordate nor amplexicaul, distinctly plicato-striate below, minutely serrulate; often nerveless, but usually two-nerved at the base; areolæ narrow. Perichætial leaves recurved at the summit. Fruitstalk as in the last, but often longer. Capsule smaller than in the last, roundish-ovate, faintly ribbed when dry. Lid conico-convex, sharply apiculate. Inflorescence dioicous. A variety, *β. heterophyllum*, is mentioned by Bridel, having oblong capsules and more slender stems.

Hypnum loreum can only be confounded with *H. squarrosum;* and is larger, with evidently striated and secund leaves.

399. 65. *Hypnum squarrosum* Dill., Linn. (*drooping-leaved Feather-Moss*); stem more or less erect, slender, irregularly pinnate; branches attenuated, drooping; stem-leaves crowded, squarrose, much recurved, ovate-acuminate, faintly striated below, serrulate, two-nerved at the base; branch-leaves narrower and less squarrose; capsule roundish-ovate, cernuous; lid conical. (TAB. XXVI.)

Hylocomium squarrosum *Bryol. Eur.*
Hypnum squarrosum, *Linn.* Sp. Pl. 1593. *Dill.* Musc. t. 39. f. 39. *Turner.* *Smith,* Eng. Bot. t. 1593. *Hedw.* *Schwaegr.* *Web. and Mohr.* *Moug. and Nestl.* n. 233. *Funck,* Moos. t. 48. n. 63. *Swartz.* *Hook. and Tayl.* *Bridel.*

Hab. Banks and woods; not common in fruit. Fr. Nov.

Stems slender, about 2 or 3 inches long, red, erect or procumbent, more or less regularly pinnate; branches straggling, ½ inch long, attenuated, drooping, and sometimes rooting at the extremity. Leaves (especially at the summit of the stem) much recurved and squarrose, crowded, ovate (not cordate) at the base, thence gradually tapering and very acute, faintly striated at the base, elsewhere smooth, minutely serrulate; branch-leaves narrower, less recurved, scarcely striate even when dry, not obviously secund, all of them two-nerved at the base, rarely nerveless; areolæ narrow, elongated. Perichætial leaves recurved at the apex. Fruitstalk about 1 inch long. Capsule roundish, cernuous or drooping; sometimes faintly ribbed when dry, as in the two preceding species. Lid conical, acute. Inflorescence dioicous.

This species is known from the last by its smaller size; and by its leaves, which are scarcely striated and not secund, especially at the top of the stem, where they are much recurved and squarrose.

A barren *Hypnum* has been found near Warrington (*H. calvescens* Wils. MS.), with the leaves widely cordate-acuminate, amplexicaul, less recurved, more distinctly two-nerved and more evidently serrated; the stems more evidently pinnate and more procumbent; in habit and character so nearly approaching to *H. brevirostre* as to be easily mistaken for it; the stems, however, are perfectly glabrous, without villi; and the leaves are very faintly striated at the base, and less suddenly acuminated. It was at first thought to be a new species; but we now perceive sufficient resemblance to some states of *H. squarrosum*, to show the possibility of its being a very remarkable variety of this species.

SECT. II. *Leaves secund.*

a. Stem pinnate, more or less erect; fructification near the middle; leaves falcato-secund.

* Leaves nerved half-way or more, nearly entire. *Adunca.*

66. *Hypnum fluitans* Dill., Linn. (*floating Feather-Moss*); monoicous; stem erect or floating, pinnate; branches short and distant; leaves loosely imbricated, falcato-secund, ovate-lanceolate, acuminate, subserrulate at the apex, nerved above half-way; capsule oblong, curved, cernuous; lid conical, apiculate. (TAB. LVIII.)

Hypnum fluitans *Linn.* Fl. Suec. ed. 2. p. 399. *Dill.* Musc. t. 38. f. 33.? and t. 83. f. 7., according to *Hooker and Arnott.* *Hedwig.* St. Crypt. iv. t. 36. *Turner.* *Smith,* Eng. Bot. t. 1448. *Web. and Mohr.* *Swartz.* *Moug. and Nestl.* n. 526. *Funck,* Moose, t. 53. n. 83. *Schwaegr.* *Hook. and Tayl.* t. xxiv. *Bridel.*
Hypnum longisetum *Schleicher* (partly).

Hab. In marshes, and in peat-ditches, bogs, &c.; not often in fruit. Fr. April, May.

Stems 6 inches to 1 foot long, and more, slender, more or less pinnate; branches short and deflexed. Leaves loosely imbricated, falcato-secund, lanceolate-acuminate, or tapering from an ovate not cordate base, slightly concave, margin plane, somewhat serrulate towards the apex; nerve thin; areolæ narrow, enlarged at the base. Perichætial leaves erect, pale. Fruitstalk 2—3 inches long, smooth, reddish. Capsule reddish-brown, cernuous. Lid acute. Inflorescence monoicous; though Bridel states the contrary.

Except in the slender pinnate stems and very narrow tapering falcato-secund leaves, this moss is so nearly allied to *H. riparium*, that it might be supposed to be a slender aquatic variety of that species. Further investigation is needful to decide whether *H. polycarpon* Bland. is to be regarded as an intermediate species, or as a variety of one or the other of these. Four varieties of *H. fluitans* are indicated by Bridel. The foliage of this species is green when young, brownish when old. A variety with suberect capsules has been gathered by Mr. Nowell on Stansfield Moor, near Todmorden.

Hypnum oligophyllum of Bridel and P. Beauv. appears to be a variety of this species, rather than of *H. riparium*, according to specimens from Martius in *Herb. Turner.* A variety, with wider, crowded leaves and short stems, was found by Mr. G. Don on the Muirfoot Hills, near Edinburgh.

401 67. *Hypnum revolvens* Swartz (*twirling Feather-Moss*); monoicous; stems flaccid, erect or procumbent, subpinnate; leaves crowded, circinnato-secund, ovate-lanceolate or ovate-acuminate, concave, subserrulate at the apex, nerved above half-way; perichætial leaves striated; capsule oblong, cernuous; lid conical, apiculate. (TAB. LVIII.)

- Hypnum revolvens *Swartz,* Musc. Suec. t. 7. f. 14. *Turner,* Musc. Hib. p. 188. *Smith,* Fl. Brit. t. 2073. (fig. not good, as to the foliage). *Schwaegr.* Suppl. t. 95.? *Funck,* Deutsch. Moose, t. 52. n. 80.
- H. aduncum ε. revolvens *Bridel. Web. and Mohr. Hook. and Tayl.*
- H. xerampelinum *Vill.* Pl. Dauph. iii. p. 902.? *Bridel,* Bryol. Univ. ii. 544.?
- H. ambiguum *Schrad.* according to *Mohr,* in Herb. Turner.

Hab. Bogs and marshes, chiefly in mountainous districts; probably not unfrequent. Near Swanlibar, Ireland, *Dr. Scott.* Secawn Mountain and Sefing Mountain, near Dublin, *Dr. Taylor.* Pools, Loch of Restenet, Forfarshire, *Mr. A. Croall.* Near Dolgelly, N. Wales; Wybunbury Bog, Cheshire, *W. Wilson.* Near Todmorden, *Mr. John Nowell.* Near Airth, *Mr. T. Lyle.* Fr. April, May.

More robust than *H. fluitans;* with crowded, purple, elegantly circinnate foliage. Stems irregularly pinnate, rather flaccid; branches curved at the apex. Leaves much crowded, circinnato-falcate, slightly tortuous when dry, purple, or deep red, shining; wider at the base, and larger than in *H. fluitans*, of firmer texture and less acuminated; the nerve thicker; areolæ narrower, not enlarged at the base of the leaf. Perichætial leaves striated, erect. Fruitstalk 1 inch long or more, smooth. Capsule and lid nearly as in *H. fluitans*.

This species has usually been regarded as a variety of *H. aduncum*; but differs in the monoicous inflorescence, and in the wider, smooth, not striated leaves. The crowded, circinnate, ovate-lanceolate, purple leaves distinguish it from *H. fluitans*. It is a very elegant moss, differing from both in the flaccid, much less regularly pinnate stems. *H. revolvens* of Schwaegrichen is doubtful, and may belong to *H. fluitans*, to which one of Swartz's own specimens named *H. revolvens* must be referred. It is probable that Swartz confounded the two species.

62 68. *Hypnum aduncum* Dill., Linn. (*claw-leaved Feather-Moss*); dioicous; stem erect, subpinnate; branches short, simple, uncinate, widely spreading; leaves crowded, circinnate or falcato-secund, lanceolate-acuminate, striated; nerve thick, continued almost to the apex; capsule oblong, curved, cernuous; lid conical. (TAB. XXVI.)

Hypnum aduncum *Linn.* Sp. Pl. 1592. *Dill.* Musc. t. 37. f. 26. *Swartz*, Musc. Suec. *Turner?* *Smith?* *Schwaegr.?* (partly). *Web. and Mohr.* *Hooker and Taylor* (partly). *Bridel.*

var. β. tenue; stem more slender; leaves shorter, less crowded, scarcely striated, nerve shorter; capsule shorter. H. aduncum *Hedw.* St. Crypt. iv. t. 24.

Hab. In marshes, probably not uncommon, but liable to be overlooked as a variety of *H. fluitans*. Plentiful in marshy heaths between West Wickham and Addington, near Croydon, *Dillenius*. Amberley Bog, Sussex, *Mr. Borrer*. Bagnley Moor, and Oak Mere, Cheshire, and Newton Heath, near Warrington, *W. Wilson*. Fr. April, May.

Stems 2—6 inches long, or more, loosely tufted, slender, with yellowish-green or fulvous shining foliage, turning brown when old, somewhat pinnate, the branches few, short, uncinate at the extremity. Leaves crowded, narrow, lanceolate-acuminate, falcate or circinnate, secund, striated, subserrulate near the base; nerve thick and opaque, reaching nearly to the apex; areolæ narrow, larger at the base; perichætial leaves erect, ovate-lanceolate, acuminate; smooth, not striated. Fruitstalk 1 inch long, or more, smooth, reddish. Capsule long and slender, subcylindrical, curved, slightly cernuous, brown. Lid conical, pointed. Inflorescence dioicous.

Essentially distinguished from *H. fluitans* by the dioicous inflorescence: the leaves also are *striated*, as described by Bridel, narrower, more crowded, more falcate, of firmer texture; nerve much thicker, and longer. C. Müller (*Syn. Musc.* ii. 323.) appears to have misunderstood this species and *H. fluitans;* misled, probably by Swartz's specimens, which (in *Herb. Hooker.*) consist partly of the true species and partly of *H. fluitans*, or by Funck's specimens, called *H. aduncum* (*Deutsch. Moose*, t. 52.), which belong to our *H. fluitans*.

We cannot quite ascertain what is intended as the type of the species in *Turn. Musc. Hib.* It would seem that *H. lycopodioides* has been mixed up in the description, though otherwise alluded to in the remark under *H. scorpioides*, as *H. rugosum* of *Linn.* Hedwig's specimen of *H. aduncum* in *Herb. Turner*, sufficiently like the figure in Hedwig's work, has shorter leaves than Swartz's, and approaches very nearly to *H. Kneiffii.* Bridel indicates several varieties of *H. aduncum;* but some of them are probably distinct species.

The alpine form of *H. commutatum* has been very often mistaken for the typical state of *H. aduncum*, and is certainly *H. rugosum* of Dickson.

A barren purple variety of *H. aduncum* (*H. Hookeri*, Turner MS. in *Herb. Turner*) was found on wet rocks of Ben Nevis, in 1810, by Mr. Borrer, and at Ballycheulish, Ireland, by Mr. Turner.

403. 69. *Hypnum Kneiffii* Schimper (*Kneiff's Feather-Moss*); dioicous; stem erect, pinnate; leaves distant, subsecund, cordate-lanceolate, acuminate, entire, nerved above half-way; perichætial leaves striated; capsule subcylindrical, curved, cernuous; lid conical. (Tab. LVIII.)

Amblystegium Kneiffii *Bryol. Eur.*
Hypnum Kneiffianum *Schimper*, in lit.
Hypnum flavescens *Schleicher;* also longisetum *Schleicher* (partly).
Hypnum fluitans var. foliis minoribus *Drummond,* Musc. Am. n. 204.
H. aduncum var. *Borrer,* in Herb. Hooker.

Hab. Swamps. Barmby Moor, Yorkshire, *Mr. Spruce.* Swamp near Newton Viaduct, Lancashire, in fruit, June 1847, *W. Wilson.* "Pond-tail," a drained pool, near Hurst Pierpoint, Sussex, *Mr. Mitten.* Amberley Wild Brook, *Mr. Borrer.* Fr. June.

Stems loosely cæspitose, 3 inches long, pale yellowish-green, pinnate; branches rather numerous, short, attenuated. Stem-leaves distant, lax, yellowish, ovate-acuminate, and ovate-lanceolate-acuminate from a cordate amplexicaul base, slightly concave, entire, nerved above half-way; areolæ narrow, elongated, larger at the base. Perichætial leaves long, erect, plicato-striated, nerved nearly to the top. Fruitstalk 2 inches long, smooth. Capsule subcylindrical, curved, with a long neck or apophysis below the sporangium. Outer teeth closely trabeculate, yellow; inner peristome with cilia 3 together. Spores small. Inflorescence dioicous.

In habit this species is intermediate between *H. fluitans* and *H. aduncum;* differing from the former in the inflorescence, and in the broader, shorter, and less falcate leaves; and from the latter in the distant, scarcely secund, broad, subcordate leaves, with a shorter nerve, striated perichætium, and apophysate capsule. C. Müller (*Syn. Musc.*) improperly unites it to *H. riparium* Lin.

404. 70. *Hypnum lycopodioides* Neck. (*large claw-leaved Bog Feather-Moss*); dioicous; stem suberect, subpinnate; branches curved; leaves crowded, falcato-secund, ovate-acuminate, con-

cave, entire, nerved almost to the apex; capsule oblong, cernuous; lid conical. (TAB. LVIII.)

H. lycopodioides *Neck.* Fl. Gallo-Belg. ii. p. 479. *Schwaegr.* Suppl. i. 2. p. 300. *Moug. and Nestl.* n. 628. *Funck,* Deutsch. Moose, t. 51. n. 75. *Bridel.*

H. rugosum *Web. and Mohr. Voit. Röhling. Swartz. Smith* (partly), Eng. Bot. t. 2250. (as to *Mr. Winch's* specimen, not *Dickson's*).

H. aduncum β. rugosum *Hook. and Tayl.*

H. diastrophyllum *La Marck and Cand.* Fl. Franc. (according to *Bridel*), not of *Swartz.*

var. β. falcatum; leaves crowded, more falcate, nerve stronger. (TAB. LVIII.)

H. falcatum *Bridel,* Bryol. Univ. ii. 526. *Web. and Mohr. Schwaegr.* Suppl. t. 145. *Röhling. Funck,* Deutsch. Moose, t. 53. n. 85.

Hab. In bogs and marshes. Bogs near Forfar, 1802, in fruit, *Mr. G. Don.* Prestwick Car, Northumberland, in fruit, *Mr. Winch* and *Mr. Thornhill.* St. Faith's Bogs, near Norwich. Yarmouth, *Mr. Turner.* Sands of Barry, near Dundee, *Mr. W. Gardiner.* Stockton Forest, near York, *Mr. Spruce.* Var. β. near Copgrove, Yorkshire, and Gorleston (*Herb. Turner*). Fruit rare, May?

Much more robust than *H. aduncum*, resembling *H. scorpioides* in size and general aspect, but the stems somewhat rigid, and the leaves ovate-acuminate, with an evident nerve continued almost to the apex; the younger ones yellowish, older ones turning brown, not purple; gradually tapering to an acute point, not apiculate, concave, much wider than those of *H. aduncum*, and also more soft and membranous, not striated nor circinnate; perichætial leaves twice as long as in that species, and evidently nerved. Inflorescence dioicous.

The var. β. differs in the more crowded and more rigid leaves, with a thick, opaque, and subcontinuous nerve; but the specimens from Gorleston are almost intermediate in character. Authentic specimens of *H. falcatum* Schwaegr., differ from our Yorkshire ones in the shorter, more ovate, and more thickly nerved leaves, and in habit approach nearer to *H. filicinum var. Vallisclausæ.* Inflorescence dioicous (not monoicous, as Schwaegrichen describes it), and thus essentially distinguished from *H. fluviatile.* The moss from the Falkland Islands, published in Hooker's *Musci Antarctici*, as *H. falcatum*, is now believed to be a distinct species (*H. longifolium* Wils. MS.), with longer and more acuminated leaves, percurrent nerve, and monoicous inflorescence, the flowers sometimes synoicous: it is an intermediate species between *H. falcatum* and *H. fluitans.*

** Leaves serrulate, nerved above half-way.

71. *Hypnum rugosum* Dill., Hedw. (*wrinkle-leaved Feather-Moss*); dioicous; stem erect, pinnate; branches recurved; leaves crowded, falcato-secund, ovate-lanceolate, corrugated, serrulate, margin recurved, nerved more than half-way; capsule sub-

cylindrical, arcuate, subcernuous; lid with a short inclined beak. (TAB. LVIII.)

Hypnum rugosum *Hedw.* St. Crypt. iv. t. 23. fig. A., and Sp. Musc. p. 293. *Dill.* Musc. t. 37. f. 24. A. B. D. according to *Hooker and Arnott.* *Ehrh.* Dec. n. 291. (not of *Weber and Mohr*). *Funck*, Deutsch. Moose, t. 51. n. 76. *Linn.* Mant. Pl. &c. *Bridel.*

Hypnum rugulosum *Weber and Mohr*, Bot. Tasch. p. 364. *Moug. and Nestl.* n. 231. *Hook. and Tayl.*

Hab. On limestone rocks, frequent; also on alpine rocks in Scotland, and on heaths and sand hills on the eastern coast of England. Common in Derbyshire, as at Dove Dale. Barren. Found with fine fruit in British North America by *Mr. T. Drummond.* (See *Drum. Musc. Am.* n. 198.) On Craig Challeach, with perigonia. Ben Lawers and Ben Voirlich.
Fr. Spring?

Stems densely tufted, rigid and elastic, 2 or 3 inches in height, the foliage of a fulvous or yellow colour, when fertile regularly pinnate; the branches rather crowded, ½ inch long or more, recurved; attenuated, and sometimes rooting at the extremity. Leaves closely imbricated, falcato-secund, corrugated at the back, ovate-lanceolate, or widely lanceolate-acuminate, serrulate above; the margin recurved, so as to appear like a thickened border; nerve extending more than half-way up the leaf. Perichætial leaves lanceolate, striated, erect. Fruitstalk 1 inch long or more, red, smooth. Capsule pale reddish-brown, subcylindrical, arcuate. Lid yellow, obliquely rostrate, half as long as the capsule. Peristome yellow. Calyptra yellowish. Inflorescence dioicous.

The name *rugosum* is here substituted for *rugulosum*, at the earnest remonstrance of Bridel (*Bryol. Univ.* ii. 635.), since it cannot be denied that the principal specimens from Gissa in the Dillenian Herbarium belong truly to this species, and not to *H. lycopodioides* (*H. rugosum* of Weber and Mohr), however ambiguous the two figures A. B. may appear. *H. rugosum* is abundantly different from *H. lycopodioides*, and grows in very different localities, preferring dry exposed declivities. The rarity of fruit may be owing to the non-occurrence of both kinds of inflorescence in the same habitat; but we observe also that in the few localities in Britain where the perigonia are produced, the antheridia are imperfectly developed. *H. plicatum* Schleicher, which is allied to this species, differs in the ramification, more slender habit, small suberect straight capsule, and conical lid; being, in fact, more closely allied to *Hypnum atrovirens.*

406. 72. *Hypnum filicinum* Dill., Linn. (*lesser golden Fern Feather-Moss*); dioicous; stem suberect, more or less pinnate, branches slender; leaves spreading, falcato-secund, ovate-acuminate, or ovate-lanceolate, serrulate, nerved almost or quite to the apex; capsule oblong, cernuous; lid conical. (TAB. XXVI.)

Hypnum filicinum *Linn.* Sp. Pl. 1590. *Dill.* Musc. t. 36. f. 21. *Hedw.* Sp. Musc. t. 76. *Turner.* *Smith*, Eng. Bot. t. 1570. *Schwaegr.* *Moug. and Nestl.* n. 228. *Funck*, Deutsch. M. t. 52. *Bridel.* *Hook. and Tayl.*

Hypnum dubium *Swartz. Eng. Bot.* t. 2126. *Turner. Dickson.*
Hypnum protensum *Turn.* Musc. Hib.
var. β.; leaves subsecund, with a very strong excurrent nerve.
Hypnum vallisclausæ *Bridel,* Bryol. Univ. ii. 534.

Hab. In marshes, on dripping rocks, and near springs. Var. β. in and near calcareous springs. Ormeshead, N. Wales. Near Calke Abbey, Derbyshire, *Rev. A. Bloxam.*

Fr. April.

Stems 2 or 3 inches long, more or less tomentous, with purplish radicles, pinnate; branches rather distant, short, attenuated. Stem-leaves deltoid-ovate, tapering upwards; branch-leaves ovate-lanceolate, acuminate; all of them secund, concave, serrulate from the base upwards, obscurely striated when dry; margin plane; nerve strong, subcontinuous, usually ceasing just below the apex, but in some varieties, especially in our variety β., excurrent; areolæ rather large, oval, or rhomboid-hexagonal, larger and pellucid at the base. Fruit-stalk an inch long, or more. Capsule curved. Lid conical, acute. Inflorescence dioicous.

This is a smaller and less elegant species than *H. commutatum*, with which it was formerly confounded, and is easily distinguished in the dry state by the leaves, which are not tortuous as in that species. When growing in dry shady places, it assumes a very slender habit, and the foliage is yellowish-brown: in this state it approaches in aspect to *H. elodes.* Many varieties are indicated by Bridel. The var. β. *vallisclausæ* is nearly allied to *H. falcatum*, but has narrower serrulate leaves, and the areolation is larger.

17. 73. *Hypnum commutatum* Dill., Hedw. (*curled Fern Feather-Moss*); dioicous; stem procumbent, radiculose, pinnate; leaves circinnato-secund, spreading, tortuous when dry, ovate-lanceolate, acuminate, plicato-striate, subserrulate, nerved more than half-way; capsule oblong, cernuous; lid conical. (TAB. XXVII.)

Hypnum commutatum *Hedw.* St. Crypt. iv. t. 26. *Dill.* Musc. t. 36. f. 19. *Turner. Smith,* Eng. Bot. t. 1569. *Web. and Mohr. Swartz. Moug. and Nestl.* n. 523. *Funck,* Deutsch. Moose, t. 52. n. 79. *Bridel. Hook. and Tayl.*
Hypnum filicinum *Vill.;* var. *Schwaegr.* Suppl. i. 2. 297.
H. diastrophyllum *Wahlenb.* Fl. Lapp. *Swartz.*
var. β. condensatum; stems cæspitose, erect, sparingly branched; leaves less circinnate, more rigid, with a longer nerve; capsule shorter.
Hypnum commutatum, forma alpina, *Bruch and Schimp.*
Hypnum aduncum *Hook. and Tayl.* (partly). *Drummond's* Musci Americani, n. 201.
Hypnum rugosum *Dickson! Smith,* Eng. Bot. t. 2250. (partly). *Dill.* Musc. t. 37. f. 24. C.
H. scorpioides *Hedwig,* in Herb. Turner.

Hab. In wet places, especially on dripping, shady, calcareous rocks; not common in fruit: var. β. in wet places on the mountains; seldom in low situations. Loch Rannoch, Perthshire, *Mr. Dickson.* Fr. April.

Stems from 4 inches to 1 foot or more in length; every where tomentous, with brownish radicles, which, in an early stage, appear as short green unbranched villi, pinnatedly branched; branches slender, about ½ inch long. Leaves rather crowded, spreading, circinnate, twisting when dry, plicato-striate, much acuminated, subserrulate, especially at the base; nerve strong, extending about ⅔ of the whole length of the leaf; areolæ narrow. Perichætial leaves erect, striated. Fruitstalk nearly 2 inches long, smooth, red. Capsule subcylindrical, arcuate, cernuous, reddish-brown. Lid conical, acute. Inflorescence dioicous.

The var. β. has been usually considered to be the larger (and indeed) typical state of *Hypnum aduncum*, and was mistaken by Dickson and Smith for the true *H. rugosum* of Hedwig. It differs from *H. aduncum*, not only in the more robust habit, but in the wider, more strongly plicated leaves, and especially in the villous or radiculose stems. From the ordinary state of *H. commutatum*, it differs chiefly in the upright, compactly cæspitose, and sparingly branched stems; in the more crowded leaves, which are of firmer texture, with a longer and stronger nerve; and in the shorter capsule: it may, however, prove to be a distinct species; for Mr. H. Beach, of Cheltenham, finds the two forms growing together, under precisely similar circumstances, and not passing into each other.

H. commutatum is known from *H. filicinum* by the longer, more circinnate, distinctly plicated leaves, twisted when dry; and the stems and branches are always covered with short setaceous villi (*stupa interfoliaris* of Hedwig, *Sp. Musc.* p. 284.); whereas, in *H. filicinum*, the stems, when young, are quite free.

H. rugosum of *Eng. Bot.* represents two species, neither of them corresponding with Hedwig's plant; one of them is *H. lycopodioides*. Dillen. *Musc.* t. 37. f. 24. C., differs considerably in the fruit from *H. rugosum* of Dickson, and may even belong to *H. atrovirens*. It is here cited, however, on the authority of Hooker and Arnott.

408. 74. *Hypnum uncinatum* Hall., Hedw. (*sickle-leaved Feather-Moss*); monoicous; stem erect, or procumbent, pinnate; leaves crowded, circinnato-secund, lanceolate-subulate from a broad base, plicato-striate, serrulate, nerved above half-way; perichætial leaves very long, erect, striated; capsule oblong, cernuous; lid conical. (TAB. XXVI.)

H. uncinatum *Hedw.* St. Crypt. iv. t. 5. *Turner. Smith,* Eng. Bot. t. 1600. *Hook. and Tayl. Bridel.*

Hab. Walls and rocks, principally in subalpine districts.
Fr. June.

Stems about 2 inches long, more slender than in the allied species. Leaves circinnate; very long and narrow, so as to appear almost setaceous, much crowded, serrulate, distinctly plicato-striate, yellowish-green and glossy, turning brown when old; nerve ceasing near the apex. Perichætial leaves very long and hair-pointed, erect, striated.

Fruitstalk 1 inch long, reddish. Capsule pale brown, subcylindrical, curved. Lid conical, acute. Inflorescence monoicous.

Distinguished from all the British allies by the inflorescence; and from *H. aduncum*, which it most resembles, by the longer, more crowded, plicate, serrulate leaves, gradually tapering from a broad base to a very fine point; and by the very long, striated perichætium.

*** Leaves striated, nerveless, or two-nerved at the base, serrulate.

99. 75. *Hypnum Crista-Castrensis* Linn. (*Ostrich-plume Feather-Moss*); stem suberect, closely pinnated; leaves circinnato-secund; stem-leaves ovate-acuminate; branch-leaves lanceolate-acuminate, plicato-striate, subserrulate, two-nerved at the base; capsule oblong, curved, cernuous; lid conical. (TAB. XXVII.)

Hypnum Crista-Castrensis *Linn.* Sp. Pl. 1591. *Hedw.* Sp. Musc. t. 76. *Eng. Bot.* t. 2108. *Schwaegr. Web. and Mohr. Moug. and Nestl.* n. 140. *Funck*, Deutsch. M. t. 50. n. 72. *Bridel. Hook. and Tayl.*

Hypnum filicinum *Hoffm. Roth. P. Beauv.* &c.

Hab. Woods; and on alpine rocks, and banks in mountainous districts. Woods in Yorkshire, *Mr. Backhouse* and *Mr. Spruce.* Above Sheep Park, at Taymouth. Abundant near the summit of Schechallion, *Mr. McIntosh.* Ben Voirlich, Hill of Kinnoul near Perth, and on Ben Lawers, *Dr. Arnott.* In a wood at the head of Hawes Water, *Rev. James Dalton.* Glen Dole, Clova Mountains, plentiful, *Mr. Drummond.* On stone walls and on banks near Loch Awe, Argyleshire, *Rev. Colin Smith.* Near Falkirk, *Mr. T. Lyle.* Trosachs, *Mrs. Robertson.* Fr. July, August.

Stem about 3 or 4 inches long, closely pectinated; branches $\frac{1}{2}$ inch long, crowded, slightly recurved. Leaves circinnato-secund, yellowish or fulvous, glossy; those of the stem ovate-acuminate; those of the branches much narrower and more circinnate, lanceolate-acuminate, distinctly plicate; margin recurved, apex serrulate. Perichætial leaves erect, striated. Fruitstalk above 1 inch long. Capsule reddish-brown, curved, cernuous. Lid conical, pointed. Inflorescence dioicous.

This truly elegant species, so rare in this country, abounds in the fir forests of Switzerland, where it grows with *Linnæa borealis.* It is distinguished from *H. molluscum* by its larger size, by its strongly striated leaves, and more regularly pectinated stems. It appears to have been almost unknown to Dillenius, and has been confounded with the following species by Linnæus and others. A specimen from Haller, but not figured, is in the Dillenian Herbarium, with *H. molluscum.*

o. 76. *Hypnum molluscum* Dill., Hedw. (*plumy-crested Feather-Moss*); stems suberect or procumbent, pinnate; leaves circinnato-secund; stem-leaves cordate-acuminate; branch-leaves ovate-lanceolate, acuminate, substriate, serrulate, obsoletely two-nerved at the base; capsule ovate, cernuous; lid conical, acuminate. (TAB. XXVII.)

Hypnum molluscum *Hedw.* St. Crypt. iv. t. 22. *Turner. Smith*, Eng. Bot. t. 1327. *Schwaegr. Web. and Mohr. Moug. and Nestl.* n. 141. *Funck*, Deutsch. Moose, t. 50. n. 71. *Swartz. Bridel. Hook. and Tayl.*
H. Crista-Castrensis *Roth. Hoffm. Linn.* Sp. Pl. 1591.? Syst. Nat. ii. p. 703. *Linn.* Fl. Suec. and Fl. Lapp. *Hudson. Dickson. Withering. Hull. P. Beauv.* (excl. Syn. Dillen.) *Dill.* Hist. Musc. t. 36. f. 20. A.

Hab. On the ground, especially on moist banks in a calcareous soil, and on limestone rocks; common. Fr. Nov.

Stems soft, 1 or 2 inches in length, pinnate; branches crowded, short. Leaves yellowish-green, somewhat glossy, slightly crisped or twisted when dry; those of the stem deltoid-ovate or subcordate, with long, narrow, tapering points, widely spreading, slightly striated but not plicate; margin plane, serrulate to the base. Perichætial leaves erect, scarcely striate. Fruitstalk about 1 inch long, slender, flexuose, twisted when dry, reddish. Capsule roundish-ovate, horizontally cernuous, reddish-brown. Lid conical-acuminate, nearly as long as the capsule. Calyptra whitish, slightly hairy. Inflorescence dioicous.

This beautiful species in its normal state is easily distinguished from all others, and especially from the preceding, by its soft stems, and by the foliage, which in a dry state is slightly crisped: the very sharply pointed lid is also a peculiarity. The calyptra when young has almost always a few scattered hairs. Many varieties have been observed, which seem to depend on soil and situation: of these the most remarkable is *Hypnum croceum* Tayl. MSS. found at Knockavohila, near Kenmare, on moist rocks, barren, with robust stems 3 inches long, densely tufted, sparingly and irregularly branched; leaves larger, of firmer texture, fulvous and glossy, distinctly striated when dry: a form similar to this, but less robust, was found by Dr. Greville, amongst heath in Inverness-shire, and may perhaps be the *var. β. Hedwigianum* of Bridel. Some states of *H. flagellare* nearly approach to this species.

b. Stem procumbent, more or less pinnate; fructification near the base; leaves falcato-secund, entire or serrulate, nerveless, or two-nerved at the base.

* Leaves acuminate. *Cupressiformia.*

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77. *Hypnum hamulosum* Frölich? (*hook-leaved Feather-Moss*); monoicous, with nidulant barren flowers; stem procumbent, pinnate; leaves circinnato-secund, ovate-lanceolate, acuminate with long narrow points, nerveless; perichætial leaves attenuated, erect, scarcely serrulate; capsule subcylindrical, arcuate; lid conical-acuminate. (Tab. LVIII.)

H. Stereodon cupressiformis κ. hamulosus *Bridel*, Bryol. Univ. ii. 610.?

var. β. micranthum; smaller in all its parts, subpinnate; leaves faintly two-nerved at base, with shorter serrulate points; capsule oval-oblong; lid rather obtuse. (Tab. LVIII.)
H. micranthum *Wils. MSS.*
H. hamulosum *Swartz* (fide *W. P. Schimper*).

H. cupressiforme var. μ. crispatissimum *Bridel*, according to specimens of the Unio Itineraria, 1828.
H. cupressiforme var. alpina terrestris *Schleicher?*

Hab. On alpine grassy declivities, and in elevated woods. Trosachs, Scotland, *Mr. Lyle* and *Mrs. Robertson.* Snowdon, *John Nowell.* Near Leeds, *Mr. McIvor.* Clova Mountains, *Thomas Drummond.* Var. β. alpine rocks. Breadalbane Mountains, 1829, and Craig-na-Lochan near Ben Lawers, 1836, *W. Wilson.* Fr. Summer.

Stems 1 inch long and more; pinnate, with numerous branches, which are curiously hooked at the extremity, where the leaves are conspicuously curved and clustered. Leaves bright green, or yellowish; very much curved, tapering upwards from an ovate-lanceolate base into a long slender subserrulate point, nerveless; margin not reflexed; areolæ narrow, at the marginal base larger and pellucid. Fruitstalk 1 inch long, smooth, reddish. Capsule contracted below the mouth when dry. Outer peristome yellow; inner with cilia 3 together. Calyptra white or yellowish. Barren flower very small, either nestling in the axilla of a leaf or attached to its surface by radicles, subsequently elongated and caulescent.

In aspect this is extremely like *H. callichroum* Bridel, which is however truly dioicous, with leaves more loosely cellular at the base. From *H. cupressiforme* it is essentially distinct in the form of the leaves, the inflorescence, and the season of maturity. Growing in denser, paler tufts; of softer texture.

2. 78. *Hypnum cupressiforme* Dill., Linn. (*cypress-leaved Feather-Moss*); dioicous; stem procumbent, subpinnate; leaves falcato-secund, elliptic-lanceolate, acuminate, scarcely serrulate, nerveless or two-nerved at the base; perichætial leaves subpiliferous, erect; capsule subcylindrical, curved, subcernuous; lid conico-rostellate, or cuspidate. (TAB. XXVII.)

Hypnum cupressiforme *Linn.* Sp. Pl. 1592. *Hedw.* St. Crypt. iv. t. 23. *Turner. Smith,* Eng. Bot. t. 1860. *Schwaegr. Web. and Mohr. Moug. and Nestl.* n. 229. *Funck,* Deutsch. Moose, t. 49. n. 69. *Bridel. Hook. and Tayl. Dill.* Musc. t. 37. f. 23. and t. 36. f. 20. B. according to *Hooker and Arnott.*

var. β. compressum; stems slender, pinnate, reddish, with compressed foliage; leaves pale green, serrulate at the apex; perichætial leaves much attenuated, serrate; fruitstalk long, slender; capsule short, cernuous, elliptic-oblong. *Dill.* Musc. t. 36. f. 22. A. B. *Turner,* Musc. Hib. p. 194. (partly). *Bridel. Hook. and Tayl.*

var. γ. minus; stem pinnate; branches slender; leaves narrow, falcate, serrulate, the margin more or less recurved; capsule small, erect.

var. δ. filiforme; branches prostrate, filiform, slender; leaves more or less falcate, serrulate; capsule short; lid with a shorter point.

H. cupressiforme ϑ. *Bridel.*

var. ε. *lacunosum;* more robust than the typical form; branches thickened; leaves larger, subcoriaceous, yellowish-brown.

H. lacunosum *Hoffm. Wieb.*

H. cupressiforme ζ. *Bridel.*

var. ζ. *longisetum;* stem slender; leaves pale, serrulate; fruitstalk elongated; capsule short, ovate.

H. cupressiforme *o. Bridel.*

H. compressum *Dickson. Turner*, Musc. Hib. 194. (partly, according to Herb. Turner).

var. η. *nigro-viride;* branches suberect; leaves short, crowded, subfalcate, dark green; capsule short, erect.

H. nigro-viride *Dicks. Turner. Smith*, Eng. Bot. t. 1620. *Dill.* Musc. t. 41. f. 53.

H. cupressiforme *v. Bridel.*

var. ϑ. *mammillatus;* capsule with a short, conical, or mammillate lid.

H. cupressiforme γ. *Bridel.*

Hab. On walls, rocks, roofs, trunks of trees, &c. frequent. Var. β. on Lound Heath, *Herb. Turner.* Delamere Forest, Cheshire, amongst heather. Scackleton Moor, Yorkshire, *Mr. Spruce.* Var. γ. and δ. on trunks of trees. Var. ϑ. on rocks near Killarney, and on walls near Conner Hill, Ireland.
Fr. Nov., Dec.

Stems more or less regularly pinnate, about 1 inch long. Leaves more or less falcate-secund, suddenly acuminated from a concave, elliptic-lanceolate or ovate base, entire or subserrulate at the apex; nerveless, or faintly two-nerved at the base; areolæ narrow, opaque and enlarged at the marginal base. Perichætial leaves much attenuated, suberect, sometimes serrulate. Fruitstalk smooth. Capsule subcylindrical, curved, subcernuous; short and suberect in some of the varieties. Lid more or less cuspidate, sometimes shortly rostrate. Inflorescence dioicous.

The variety β. *compressum* is remarkable for its lax slender habit, pale serrulate foliage, and short cernuous capsule. It has the aspect of a distinct species. The specimens figured by Dillenius (A.) were gathered in a wood near Tottenham; fig. B., which most resembles our Cheshire specimens, is from one given by Vaillant to Sherard.

Var γ. *minus* is remarkable for its small falcate leaves, reflexed in the margin.

Extremely variable as is this species, it may always be distinguished by the characters above given.

413. 79. *Hypnum resupinatum* Wilson (*upward-turned Feather-Moss*); dioicous; stem creeping, subpinnate; leaves secund, assurgent, scarcely falcate, ovate-lanceolate, acuminate, nerveless, entire; capsule erect, almost symmetrical; lid rostrate. (TAB. XXVII.)

Hypnum multiflorum *Taylor*, in Flora Hibern. ed. 2.

p. 46. (not of *Schwaegr.* Suppl. i. 2. 202.; the name therefore changed with *Dr. Taylor's* concurrence).
H. polyanthos *Eng. Bot.* t. 1664. (not Leskea polyantha *Hedw.*) *Turner. Smith. Dill.* Musc. t. 42. f. 62. t. 37. f. 23. D.
H. cupressiforme var. γ. tenue *Hook. and Tayl.*
H. incurvatum var. γ. Swartzii *Bridel*, Br. Univ. ii. 453.
Leskia plumoso *Swartz?* See *Web. and Mohr*, Bot. Tasch. p. 312.
H. piliferum β. filiforme *Bridel*, Br. Un. ii. 491.?

Hab. On walls, rocks, and trunks of trees, not unfrequent; growing in company with *H. cupressiforme*. Fr. Oct.—Dec.

Of a more slender habit than the last. Leaves smaller, erecto-patent, secund, *pointing upwards*, not downwards as in *H. cupressiforme*. Capsule erect, oblong, almost symmetrical. Lid obliquely rostrate, above half as long as the capsule.

The leaves of this species very much resemble those of the true *Leskea polyantha*, but are less suddenly and more shortly acuminated; and those of the perichætium are much more attenuated: they differ essentially in the form of the lid, in the structure of the peristome, and in the inflorescence. It may possibly be a variety of *H. cupressiforme*; but if so, it is a permanent form, growing frequently in the same situations with the typical species.

4. 80. *Hypnum pratense* Koch. (*wet-meadow Feather-Moss*); dioicous; stem suberect, sparingly branched, branches subcomplanate; leaves complanato-secund, lax, ovate-lanceolate, nerveless; capsule narrowly ovate, tapering at the base, cernuous; lid conical. (Tab. LVIII.)

Hypnum pratense *Bridel*, Bryol. Univ. ii. 769.?
H. amœnum *Drummond's* Musci Americani, n. 196. (not of *Hedw.*)
"H. curvifolium *Hedw.* var. pratense *Koch.*" *Hampe*, Musc. No. 96.

var. β.; leaves more falcato-secund, scarcely complanate.
H. circinnatum *Schleicher?* (not of *Frölich*, in *Bridel*, Bryol. Univ.)

Hab. Moist banks; and in wet drains in pastures and fallows, in a calcareous soil; the fruit not found in Britain, but common in the Pyrenees. Sussex, *Mr. Borrer*. Var. β. frequent about Warrington, *W. Wilson*. Yorkshire, *Mr. Spruce*. Near Newton Viaduct, Lancashire, with perigonia. Ireland, *Miss Hutchins* (Herb. Turner). Scotland, *Mr. T. Lyle*. Fr. Summer?

Stems cæspitose, about 2 inches in height, very sparingly branched, scarcely pinnate. Leaves loosely imbricated, pale green; almost complanate in fertile specimens, more falcate in a barren state; ovate-lanceolate; acute, but not at all acuminated; entire or subserrulate at the apex; nerveless, or sometimes faintly two-nerved at the base; margin plane; areolæ wider than in *H. cupressiforme.* Perichætial leaves linear-lanceolate, subserrulate at the apex. Fruitstalk nearly 2 inches long, reddish, smooth. Capsule ovate, tapering below, curved, cernuous, rather small. Lid conical. Inflorescence dioicous.

This species differs from all the varieties of *H. cupressiforme* in the form of the leaf, which is not at all acuminated.

415. 81. *Hypnum ochraceum* Turn. (*yellow Mountain-rill Feather-Moss*); dioicous; stem suberect, sparingly branched, flaccid; leaves secund, ovate-lanceolate, concave, nerve forked; perichætial leaves recurved; capsule cernuous, tapering at the base; lid conical. (Tab. LVIII.)

Hypnum ochraceum *Turner*, in Herb. Turner.
H. simpliciusculum *Mohr*, in Herb. Turner.
H. palustre *and* H. scorpioides, "alpine states," *W. Gardiner.*
H. palustre var. *and* H. aduncum var. *Hooker*, in Herb. Hooker.

Hab. On stones in and near alpine or subalpine rivulets. On Ben Nevis, 1808, *Hooker and Borrer.* Near Bantry, *Miss Hutchins.* Clova and Loch-ne-gar, not unfrequent, but rare in fruit, Aug. 1807, *G. Don.* Bogs at the head of Glen Callater and Canlochan, Clova; on Ben Avon and Ben-nabourd, *W. Gardiner.* Sefing Mountain, Co. Wicklow, in fruit, *Dr. Taylor.* Ballycheulish, 1807, *D. Turner.* Penzance, *Mr. Ralfs.* Carron Water, *T. Lyle.* Kelly's Glen, Co. Dublin, May 1849, in fruit, half-buried in debris of granite, *Mr. D. Moore.* Gorple Clough, near Todmorden, in fruit, June 1851, *John Nowell.* Fr. May, June.

Stems tufted, erect, or procumbent, filiform, flaccid, sparingly branched, 2—4 inches long. Leaves yellowish, more or less secund, sometimes falcate, rather distant, concave, ovate-lanceolate, entire; the base narrower than in the preceding species, with the marginal cellules in that part enlarged and pellucid; nerve single or forked, extending half-way or more. Perichætial leaves somewhat squarrose, ovate-lanceolate, entire. Fruitstalk nearly an inch long, smooth, reddish. Capsule cernuous, tapering remarkably into the fruitstalk. Lid short, conical.

This moss was gathered by Mr. Menzies on the west coast of N. America, in 1792 (No. 57.). It is abundantly distinct from *H. palustre* in the form of the leaf, in the squarrose perichætium, and in the dioicous inflorescence.

** Leaves roundish, very concave, apiculate, entire. *Scorpioidea.*

416. 82. *Hypnum scorpioides* Dill., Linn. (*scorpion Feather-Moss*); stem erect, or procumbent, irregularly pinnate; branches short, simple; leaves crowded, falcato-secund, roundish-ovate, ventricose, apiculate, entire, nerveless or faintly two-nerved at the base; capsule oblong, curved, cernuous; lid conical, apiculate. (Tab. XXVII.)

Hypnum scorpioides *Linn.* Sp. Pl. 1592. *Dill.* Musc. t. 37. f. 25. *Hedwig?* *Schwaegr.* Suppl. t. 95. (fig. not good as to the leaves). *Turner.* *Smith,* Eng. Bot. 1039. (fig. not good). *Web. and Mohr.* *Moug. and Nestl.* n. 522. *Funck,* Moose, t. 51. n. 74. *Hook. and Tayl.* *Bridel.*
H. squarrosum *Timm.*
H. lycopodioides β. *Neck.*
H. crassum *Schum.*
H. fuscum *Schleich.*

Hab. Bogs; not common in fruit. Sands of Barry, *Mr. Drummond.* Near Killin, Perthshire. Near Malham, Yorkshire, and Wybunbury Bog, Cheshire, *W. Wilson.* St. Faith's Bog, near Yarmouth. Near Airth, *Mr. Lyle.* Fr. May.

Stems 4 inches long and more, weak and flaccid; erect when growing in spongy bogs; procumbent when on wet rocks or in rills; sometimes, when growing in peat-holes, much longer and larger. Leaves imbricated, falcato-secund, large and ventricose, or somewhat conduplicate; mostly purplish-brown or lurid, sometimes yellowish-brown; soft and membranous; when flattened roundish-apiculate; entire, faintly two-nerved at the base, or nerveless. Perichætial leaves erect. Fruitstalk nearly 2 inches long, smooth, reddish. Capsule short and tumid, curved, cernuous, pale brown. Lid conical, pointed. Inflorescence dioicous.

The true form of the leaf, not apparent until flattened, is then seen to be very different from that of *H. aduncum* and its allies, and more like some states of *H. palustre.* *H. scorpioides* is one of the largest species of the genus.

Hedwig's specimen, sent to Mr. Turner as *H. scorpioides*, is *H. commutatum var.* β. (H. rugosum *Dickson*). Schwaegrichen's figure too much resembles *H. lycopodiodes.*

c. Stem quite prostrate, sparingly and irregularly branched; leaves slightly secund, entire or serrulate, nerveless, or two-nerved at the base.

7, 83. *Hypnum demissum* Wilson (*prostrate-rock Feather-Moss*); monoicous; stem prostrate, filiform; branches few, short, slender; leaves erecto-patent, subsecund, elliptic-lanceolate, acute, nerveless, entire, margin slightly reflexed; capsule cernuous, narrowly elliptical; lid rostrate. (TAB. LIX.)

Rhynchostegium demissum *Bryol. Eur.*
Hypnum demissum *Wilson,* in Eng. Bot. Suppl. t. 2740. *Hooker,* Brit. Fl. (Addenda). *Taylor,* in Fl. Hib.
H. flavescens *Wilson MSS.* *Hooker,* Br. Fl. p. 79.
H. Schimperi *Bruch MSS.*

Hab. On shady rocks in mountainous districts. Cromagloun Mountain, near the Upper Lake of Killarney, and near

Glengariff, Ireland, 1829; also near Beddgelert, N. Wales, *W. Wilson.* Fr. July, Aug.

This elegant moss grows in extensive flakes, of a shining yellowish hue, on the inclined faces of rocks; the stems prostrate in one direction, not interlaced, weak and flaccid; the branches few, short, and of a reddish colour. Leaves loosely imbricated, slightly spreading, somewhat secund upwards; margin reflexed, entire; areolæ narrow, elongated. Perichætial leaves erect, lanceolate. Fruitstalk ½ inch long, very slender, smooth, reddish. Capsule small, horizontally cernuous, often symmetrical, pale brown, contracted below the mouth when dry. Lid with a long slender beak.

This is so unlike every other British species, that its place in the series is not easily determined. It is nearly allied to *H. crassiusculum* Schwaegr. Suppl. t. 91., but that is a smaller moss with an erect capsule, and is a true *Leskea*, closely allied to *L. cæspitosa* of Hedwig. *H. demissum* is found in N. America; and a variety with wider flaccid leaves occurs in Maryland. (See *Musci Allegh.* of Sullivant and Gray, n. 48. and 49.)

418. 84. *Hypnum micans* Wilson (*sparkling Feather-Moss*); dioicous; stem prostrate, slender, filiform, with few short simple branches; leaves spreading, subsecund, roundish, apiculate, concave, serrulate, obscurely two-nerved at the base. (TAB. LIX.)

Hypnum micans *Wilson*, in Hooker, Brit. Fl. p. 86. *Taylor*, in Fl. Hib. ed. 2. p. 42.

Hypnum elegans *Turner MSS.* in Herb. Turner.

Hab. On shady rocks in the South of Ireland; not yet found in fruit. Near Glengariff, *Miss Hutchins.* Cromagloun Mountain, and at Fila Doun, near Killarney, *W. Wilson.*

Stems prostrate, slender and flaccid, like the preceding species, and growing in similar situations, forming glossy flat patches of a yellowish colour. Branches few, short, depressed or suberect. Leaves almost orbicular, or roundish-elliptical, apiculate, or subacute, concave, narrowed at the base, serrulate towards the apex, obscurely two-nerved, or nerveless; margin slightly reflexed below; areolæ rather large, elongated; colour yellowish, very glossy when dry. Inflorescence dioicous; barren flower not seen; fertile flower with erect, ovate-lanceolate, serrated leaves; archegonia 7 or 8, with short paraphyses.

Dr. Taylor's remarks, in reference to the similarity of this moss to the slender variety of *H. cupressiforme* found upon trees, can apply only to similarity in size and habit: in character they are wholly different; and it is not improbable that the fruit may show it to be a *Leskea*. It is retained here provisionally, on account of its being the associate of the preceding species when growing, and not unlike it in general aspect. If it be a *Leskea* it will rank near to *L. moniliformis*. It is not very closely allied to any other known moss. In the form of the leaf it approaches to *Hypnum flagellare*; but is widely different in habit. The foliage is sometimes of a green colour; but usually a pale yellow.

d. Leaves secund, *turned upwards*, entire, or serrulate, nerveless, or two-nerved; stem creeping or suberect.

19. 85. *Hypnum incurvatum* Bridel, Schrader (*incurved Feather-Moss*); monoicous; stem creeping, subpinnate; branches incurved at the apex; leaves loosely imbricated, secund, assurgent, ovate-lanceolate, acuminate, entire, two-nerved at the base; capsule shortly ovate, cernuous; lid conical. (TAB. LIX.)

Hypnum incurvatum *Schrader*, Crypt. Gew. n. 80. *Roth. Röhling. Moug. and Nestl.* n. 934. *Funck*, Deutsch. Moose, t. 49. *Web. and Mohr. Schwaegr.* Suppl. t. 94. *Bridel. Wilson*, in Eng. Bot. Suppl. t. 2839.

Hab. On walls and stones in shady situations, chiefly in limestone districts. Helk's Wood, near Ingleton, Yorkshire; and on walls by the road-side near Kendal, 1838, *W. Wilson.* Teesdale, *Mr. Spruce.* Ochills, Scotland, *Mr. T. Lyle.*

Fr. June, July.

Growing in rather dark green patches; intermixed often with *H. populeum.* Stems creeping, more or less regularly pinnate; the branches depressed, curved upwards at the top. Leaves all bending upwards, similar in form to those of *H. resupinatum;* but less membranous, and more evidently two-nerved at the base. Perichætial leaves lanceolate, acuminate, suberect. Fruitstalk ½ inch long or more, reddish. Capsule small, pale brown, shortly ovate, horizontal. Annulus distinct. Lid short, acutely conical. Inner peristome with cilia. Inflorescence monoicous.

Very distinct from all the varieties of *H. cupressiforme*, and from *H. resupinatum* in the short horizontal capsule, conical lid, and monoicous inflorescence; ripening its fruit also at a different season. Two varieties are indicated by Bridel; but one of these, *var.* γ. *Swartzii*, may be *H. resupinatum.* It appears to have been sent (a solitary specimen, without operculum) by Swartz to Mohr, named *Leskea plumosa* Sw. (See *Weber and Mohr*, Bot. Tasch. p. 312.)

86. *Hypnum pulchellum* Dickson (*neat Mountain Feather-Moss*); monoicous; stem scarcely creeping; branches erect, fastigiate; leaves crowded, subcomplanate, secund, assurgent, lanceolate-tapering, entire, nerveless; capsule oblong, subcernuous; lid conical, apiculate. (TAB. XXV.)

Plagiothecium nitidulum *Bryol. Eur.!*

Hypnum pulchellum *Dickson*, Crypt. Fasc. 2. t. 5. f. 6. (the figure wrong as to the magnified leaf). *Turner. Smith*, Eng. Bot. t. 2006. *Schwaegr. Web. and Mohr. Funck*, Deutsch. Moose, t. 49. n. 66. *Bridel. Hook. and Tayl.*

Hypnum nitidulum *Wahlenb.* Fl. Lap. p. 370. *Bruch and Schimper!*

Leskea pulchella *Hedw.* Sp. Musc. t. 55. f. 7—12.

L. nitidula *Wahlenb.* in *Web. and Mohr*, Ind. Musc.

Hab. Shady rocks in mountainous districts; sometimes at the roots of trees by rivulets. Den of Rechip, Perthshire. Fre-

quent in Scotland. Ireland, *Dr. Taylor.* Welsh Mountains, *W. Wilson.* Near Todmorden, Lancashire, *John Nowell.* Near Sedberg, *Rev. G. Pinder.* Teesdale, *Mr. Spruce.*
Fr. June, July.

A small species, growing in dense green glossy tufts. Branches more or less erect, crowded, fastigiate, scarcely ½ inch long, usually compressed. Leaves almost distichous, but turned to the upper side, rather crowded; tapering gradually from the base to an acute point, so as to be triangular rather than lanceolate; entire, mostly without any trace of a double nerve at the base. Perichætial leaves erect. Fruitstalk not an inch long, reddish; inserted near the base of the fertile branch among the roots. Capsule pale brown, suberect, curved, oblong, tapering into the fruitstalk, contracted below the mouth when dry. Lid conical, pointed, short, yellowish. Peristome pale yellow; inner one with cilia. Inflorescence monoicous.

There can be no question that this is the original species of Dickson; though his figure of the magnified leaf seems to have been inadvertently taken from some very different moss with nerved leaves, and of a different shape. Wahlenberg's description of *Hypnum nitidulum* (confirmed by specimens from Swartz in *Herb. Turner*) proves it to be the same; though Dr. Swartz has given another species under the name of *Hypnum nitidulum*, which Bruch and Schimper have distributed and at length published as *H. pulchellum* of Dickson: that species, however, is not even known to be a native of Britain, and differs thus from Dickson's moss: Leaves shorter and smaller, widely ovate-acuminate, more evidently secund, less glossy when dry, areolæ wider and shorter; capsule shorter, of a brighter reddish tint when fully ripe; and the lid less pointed. It is given in some sets of Drummond's *Musci Americani*, n. 167. for *H. pulchellum*, by mistake.

To prevent further confusion, we propose the name *H. rutilans* instead of *H. pulchellum* for the moss so named in *Bryol. Eur.*

421. 87. *Hypnum Mühlenbeckii* Bruch and Schimper (*Mühlenbeck's Alpine Feather-Moss*); monoicous; stems tufted, suberect; branches fasciculate; leaves spreading, subcomplanate, subsecund, deltoid-ovate, acuminate, serrulate, nerveless or two-nerved at the base; capsule oblong, suberect, tapering at the base, striated when dry; lid conical. (TAB. LIX.)

Plagiothecium Mühlenbeckii *Bryol. Eur.*
Hypnum Mühlenbeckii *Bruch and Schimper*, in lit.
Hypnum Silesianum *Smith*, Eng. Bot. t. 2016. *Hook. and Tayl. Drummond*, Musc. Am. n. 168. (not of *P. Beauv. Schwaegrichen*, and *Bridel*).
H. striatellum *C. Müller*, Synops. Musc.
Leskea striatella *Bridel*, Br. Un. (fid. *C. Müll.*)

Hab. Alpine rocks. Breadalbane Mountains, not unfrequent. Clova Mountains, in hollow places in grassy declivities. Summit of Ben Luyal, in Sutherland. Near the summit of Morne, *Mr. W. Gardiner.*
Fr. July.

Growing in dense green tufts, glossy when dry. Stems less than ½ inch in height, brittle, suberect, slightly arched, with fasciculate branches, well represented in the figure in *English Botany*; branches somewhat recurved or drooping, ¼ inch long, brittle. Leaves not much crowded, widely spreading, subsecund, and sometimes a little compressed, deltoid-ovate, or subcordate, acuminate, evidently serrulate, dark green, glossy when dry, of firm texture, nerveless, or faintly two-nerved at the base; areolæ rhomboid, rather large. Perichætial leaves lanceolate, acuminate, serrulate, erect. Fruitstalk not an inch long, reddish. Capsule at first yellowish, pale brown when ripe, oblong or subclavate, tapering at the base, inclined or suberect, slightly curved, striated when dry. Lid short, conical. Inflorescence monoicous.

Distinguished from the next by the ovate flattish leaves and striated capsule: it is also a truly alpine species.

22. 88. *Hypnum Silesiacum* Seliger, P. Beauv. (*Silesian Feather-Moss*); monoicous; stem procumbent, with few fasciculate, arcuate branches; leaves loosely imbricated, secund, assurgent, ovate-lanceolate, acuminate, concave, serrulate, faintly two-nerved at the base; capsule elongated, subcylindrical, curved, cernuous; lid conical. (TAB. LIX.)

Plagiothecium Silesiacum *Bryol. Eur.*

Hypnum Silesiacum *Web. and Mohr. Schwaegr.* Suppl. t. 94. *Funck*, Deutsch. Moose, t. 49. n. 68. *Moug. and Nestl.* n. 425. *P. Beauv.* Prodr. p. 70.

Leskea Seligeri *Bridel*, Musc. Rec. ii. 2. p. 47., confirmed by a specimen from *Dr. Swartz* in Herb. Hooker, and by another from *Schleicher* in Herb. Turner.

Hab. On the stems of decaying trees, and on stones, rocks, &c.; rare in Britain. Abbey Wood, near Plumsted, Kent, April, 1843, *Mr. W. Mitten.* On stones in Arncliff, Eskdale, Yorkshire, Dec. 1847, *Mr. Spruce.* Fr. April, May.

Stems procumbent, with procumbent, slightly incurved, fasciculate branches about ⅓ of an inch long, inserted at the rooting base, from which the fructification is produced; less brittle than in the preceding species. Leaves secund, directed upwards, but their points bending downwards, concave, ovate-lanceolate, narrowly acuminate, longer than in the preceding species, more evidently serrulate, faintly two-nerved at the base, yellowish; areolæ narrow, elongated. Perichætial leaves short, slightly recurved, scarcely covering the vaginula. Fruitstalk an inch long, reddish. Capsule long, curved, quite smooth when dry, bright reddish-brown when fully ripe, at first yellowish-brown. Lid conical, reddish-brown, pointed. Inflorescence monoicous.

The longer, almost lanceolate, concave leaves, and elongated smooth capsule, distinguish this from *H. Mühlenbeckii*, which is a smaller species. The fructification also is more truly radical, as in *H. denticulatum*; and the foliage is not at all complanate.

SECT. III. *Leaves complanate; stems procumbent.*

a. Fructification radical, from the base of the surculus.

* Leaves undulated.

3 89. *Hypnum undulatum* Dill., Linn. (*waved Feather-Moss*); dioicous; stem procumbent, with few subfasciculate branches;

leaves complanate or compressed, ovate, acute, undulated, entire, faintly two-nerved at the base; capsule subcylindrical, cernuous, striated when dry; lid rostellate. (Tab. XXIV.)

Plagiothecium undulatum *Bryol. Eur.*

Hypnum undulatum *Linn.* Sp. Pl. 1589. *Hedwig. Schwaegr.* Suppl. t. 282. *Turner. Smith*, Eng. Bot. t. 1181. *Moug. and Nestl.* n. 45. *Funck*, Deutsch, Moose, t. 37. n. 3. *Web. and Mohr. Bridel. Hook. and Tayl. Dill.* Musc. t. 36. f. 11., and t. 40. f. 44. E., according to *Hooker and Arnott.*

Hab. In woods and dry heathy places. Fr. April, May.

Stem and branches quite procumbent, with complanate foliage, reddish; branches 2 inches long and more, usually simple. Leaves complanate, ovate, acute, not acuminate, transversely undulated, or rugose, entire, faintly two-nerved at the base, whitish, or very pale green; areolæ narrow. Fruitstalk 2 inches long. Capsule curved, yellowish-brown, furrowed when dry. Lid about half as long as the capsule, with a short beak. Calyptra yellowish. Inflorescence certainly dioicous; not polygamous, as Schwaegrichen describes it.

Bridel describes the leaves "imbricatim disticha;" but in this and all the allied species, as also in *Omalia*, *Neckera*, &c., they are inserted in 8 rows (disp. $\frac{3}{8}$), and differ only from those of other species in being all horizontally compressed.

** Leaves even, not undulated.

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90. *Hypnum sylvaticum* Dill., Linn. (*wood Feather-Moss*); dioicous; stem decumbent, sparingly branched; leaves subcomplanate, narrowly ovate, entire, two-nerved, smooth with plane margins; capsule subcylindrical, cernuous; lid with a short beak. (Tab. LIX.)

Plagiothecium sylvaticum *Bryol. Eur.*

Hypnum sylvaticum *Linn.* Mant. pl. ii. p. 310. *Dill.* Musc. t. 34. f. 6. *Swartz. Schwaegr.* Suppl. t. 87. *Funck*, Deutsch. Moose, t. 37. n. 2. *Moug. and Nestl.* n. 515. *Web. and Mohr. Bridel. Wilson*, in Eng. Bot. Suppl. t. 2936.

Hypnum denticulatum var. β. sylvaticum *Turner*, Musc. Hib. p. 146. t. 12. f. 1. *Smith.*

H. denticulatum (partly) *Hook. and Tayl.*

Hab. In woods, at the roots of trees; perhaps as frequent as the next species. Fr. Sept.

Stem with very few subfasciculate branches, about an inch long, bearing fructification, and sending out descending stolons near the base. Leaves less truly complanate than in *H. denticulatum*, occasionally subsecund, slightly concave, narrowly ovate or ovate-lanceolate, not acuminated, entire, shrinking and somewhat tortuous when dry, of a darker green than in the next species, with larger areolæ and more evidently two-nerved, the nerves often extending halfway up the leaf; the margin plane, never recurved. Perichætial leaves recurved at the summit. Fruitstalk $1\frac{1}{2}$ in. long, pale, smooth. Capsule more or less cernuous or horizontal, olive-coloured, paler and larger than in *H. denticulatum ;* when dry quite smooth, not furrowed, and the mouth dilated. Outer teeth pale yellow. Annulus and spores larger than in the next. Lid longer, with an evident beak, half as long as the capsule.

This species has been much confounded with *H. denticulatum*, but is essentially distinguished by its dioicous inflorescence : it is a more robust species, with darker green and less glossy foliage, shrinking much when dry, and has a very different lid. Dillenius has well described it. Little if any reliance can be placed on the supposed difference of structure of the inner peristome. The two species often grow intermixed ; and mistakes may have arisen from this cause.

25. 91. *Hypnum denticulatum* Dill., Linn. (*sharp flat-leaved Feather-Moss*) ; monoicous ; stem prostrate, sparingly branched ; branches subfasciculate ; leaves complanate, obliquely ovate, acuminate, two-nerved at the base, margin reflexed below ; capsule oblong, inclined ; lid conical, acute. (Tab. XXIV.)

Plagiothecium denticulatum *Bryol. Eur.*

Hypnum denticulatum *Linn.* Sp. Pl. 1588. *Dill.* Musc. t. 34. f. 5. *Hedw.* St. Crypt. iv. t. 31. *Turner. Smith*, Eng. Bot. t. 1260. *Schwaegr. Web. and Mohr. Moug. and Nestl.* n. 46. *Funck*, Deutsch. Moose, t. 37. n. 1. *Bridel. Hook. and Tayl.* (partly).

var. β. obtusifolium ; leaves elliptical, more or less obtuse, slightly concave.

H. denticulatum β. obtusifolium *Hook. and Tayl.—var. γ. Turner*, Musc. Hib. p. 146. t. 12. f. 2. *Bridel.*

H. obtusatum *Wahlenb.* Fl. Lapp. p. 371.

H. obtusifolium *Brid.* Meth.

H. Donianum *Smith*, Eng. Bot. t. 1446.

var. γ. succulentum ; leaves with almost plane margins ; inflorescence synoicous.

H. succulentum *Wilson MS.*

Hab. In woods, and on hedge-banks ; also on wet rocks in subalpine situations ; var. β. on alpine rocks ; var. γ. Winwick Stone Quarry, near Warrington. Near Todmorden, *Mr. John Nowell.* Fr. Summer.

Stems about an inch long, quite prostrate, bearing fructification at the base, from which part the branches or innovations are produced. Leaves complanate, light green, glossy, and very little altered when dry, more crowded than in the preceding species, obliquely ovate with a short tapering point, entire, or sometimes serrulate at the apex ; margin recurved in the lower half ; shortly two-nerved at the base ; areolæ rather narrow, larger at the base. Fruitstalk about an inch long, reddish. Capsule less elongated than in the preceding species, and less cernuous, more or less tinged with deep red. Outer teeth reddish-brown. Lid acutely conical, not beaked, shorter than in *H. sylvaticum.* Inflorescence truly monoicous.

The ordinary form of this species, growing on shady banks and in woods, is easily distinguished from the preceding ; but the mountain form, figured at t. 1260. of *Eng. Bot.*, growing in dense patches on wet rocks, with erect stems, has often been mistaken for the true *H. sylvaticum:* it is, however, only a local and luxuriant state of this species. The var. γ. is remarkable for its great similarity in habit and foliage to *H. sylvaticum*, and for its large, tumid, synoicous flowers: it may eventually prove to be a distinct species. Bridel's *var. β. sylvaticum* Bryol. Univ. ii. 553., which is said to be the *H. sylvaticum* of most authors, if not identical with the mountain form above mentioned, is scarcely intelligible as a variety; nor does the cited figure of Dillenius (t. 34. f. 5. B.) differ sensibly from the ordinary form of the species. *Leskea læta* of Bruch and Schimper, if correctly exhibited in specimens so named from M. Hampe, is only a small state of *H. denticulatum.* Dr. Swartz sent a very slender variety, *var. gracile*, to Mr. Turner, which is marked by Sir J. E. Smith "*H. complanatum* of *Herb. Linn.*"

426. 92. *Hypnum elegans* Hooker (*elegant Feather-Moss*); dioicous; stems prostrate, with complanate branches; leaves complanate, ovate-lanceolate, oblique, slender-pointed, obscurely toothed at the apex, nerveless or two-nerved at the base; capsule ovate, more or less pendulous; lid conical, shortly rostellate. (TAB. LIX.)

Hypnum elegans *Hooker*, Musc. Exot. t. 9. *Bridel. Schwaegr.* Suppl. t. 282. b.
H. planifolium *Bridel*, Bryol. Univ. ii. 411.
Leskea prostrata *Tayl. MS.*
Hypnum Borrerianum *Spruce MS.*
var. β. collinum; stems erect, tufted; leaves subsecund.
H. collinum *Wils. MS.*

Hab. On shady banks and rocks, frequent, but usually barren; often growing with *H. denticulatum.* In fruit, near Bantry, *Miss Hutchins* (in *Herb. Turner*, named *H. denticulatum*). Ardingley Rocks, Sussex, in fruit, *Mr. Mitten.* The barren plant found at Turk Waterfall, and in other places near Killarney, *Dr. Taylor.* Near Castle Howard, Yorkshire, *Mr. Spruce.* Eridge Rocks, near Tunbridge, *Mr. Mitten.* Sandy banks at Hill Cliff, and at Orford, near Warrington, *W. Wilson.* Todmorden, on shady rocks, *Mr. John Nowell.* Var. β. on Congleton Cloud, Alderley Edge, and Frodsham Rocks, Cheshire, *W. Wilson.* Near Airth, Scotland, *Mr. T. Lyle.* Fr. March, April.

This beautiful species grows in extensive, depressed, shining green patches, retaining their brilliancy when dry, and thus readily distinguishable at sight from *H. denticulatum*, with which it has often been confounded. Stems and branches prostrate; branches distichous, subfasciculate, occasionally somewhat pinnate; often proliferous, bearing numerous clusters of short, deciduous, flagelliform ramuli. Leaves spreading in two directions, complanate, plane, ovate-lanceolate, acuminate, slender-pointed, almost piliferous, often slightly oblique or falciform, as represented in *Musci Exot.*, distantly and obscurely toothed near the apex, bright green, glossy when dry, nerveless or faintly two-nerved at the base; margin plane; areolæ much narrower than in *H. denticulatum*, elongated. Perichætial leaves lanceolate-acuminate, serrulate. Fruitstalk smooth. Capsule narrowly elliptical, rather small. Lid about half as long as the capsule, conical-apiculate, or very shortly rostellate. Inflorescence dioicous.

This species, when once attentively examined, will be found perfectly distinct from every form of *H. denticulatum.* It differs from that species in the smaller size; in the slender-pointed almost piliferous leaves, of closer texture, very glossy, and not shrivelled when dry; also in the ramification and inflorescence. Specimens gathered by Mr. Spruce in the wood by Old Crambeck Bridge, Yorkshire, have the leaves more evidently nerved than in original examples of *H. elegans*, and not unfrequently substriated: in this state it has been repeatedly passed by as a compressed state of *H. cupressiforme*, and may even be Bridel's *var.* λ. *complanatum.* Fertile specimens from Sussex have the leaves as much secund as in North American examples: in a barren state this species varies much in size and habit. It is probably common all over Britain.

b. Fructification from various parts of the stem and branches.

7. 93. *Hypnum depressum* Bruch (*depressed Feather-Moss*); dioicous; stem prostrate, with pinnate subdivisions; branches widened or thickened in the middle; leaves complanate, laterally spreading, crowded, ovate, slightly concave, subserrulate, two-nerved at the base; capsule ovate, cernuous; lid rostrate. (TAB. LIX.)

Rhynchostegium depressum ***Bryol. Eur.***

Hypnum confertum ζ. depressum ***Bridel,*** Bryol. Univ. ii. 767.

Hab. On rocks and stones, especially such as are calcareous, with *H. murale*, and *H. crassinervium.* Mill Dingle, near Beaumaris, Anglesey, 1828, *W. Wilson.* Mowthorpe Dale, and in the wood by the Castle Howard Station, plentifully, *Mr. Spruce.* Near Todmorden, and at Gordale, Yorkshire, *John Nowell.* Trosachs, *Mr. Lyle.* The fruit not found in Britain. Fr. Spring.

Stems repeatedly subdivided, longer and less fragile than in the preceding species, with less glossy foliage, the subdivisions more evidently pinnate, and the branches wider and thicker in the middle than at the extremities. Leaves crowded, evidently compressed, but also somewhat concave, ovate or ovate-oblong; acute, not acuminated nor slender-pointed as in the last; more or less evidently serrulate, two-nerved at the base or sometimes nerveless, deep green, somewhat glossy when dry, not reflexed in the margin; areolæ narrowly rhomboid, larger and wider than in the last. Perichætial leaves suberect. Fruitstalk scarcely ½ inch long, reddish, smooth. Capsule ovate-oblong, curved. Lid rostrate, as long as the capsule. Inflorescence dioicous.

Bridel was unable to distinguish this moss from *Hypnum confertum*: it differs, however, in the inflorescence, in the ramification, and in the almost nerveless not acuminated leaves, which are also decidedly complanate. A variety of *H. depressum*, with narrower and more acute leaves (*H. lapidinum* Wils. MS.), was gathered by Dr. Taylor at Turk Waterfall.

SUBORDER XXXIII. OMALIEÆ.

84. OMALIA *Bridel.*

HYPNUM (partly) *Hook. and Tayl.*

Stems subpinnate, arising from a creeping rhizoma, and producing stolons from the base; somewhat rigid and elastic.

Leaves complanate, elliptic-oblong, falciform, obtuse or apiculate, serrulate at the apex, nerveless or faintly nerved at the base, not undulated; glossy, and scarcely altered when dry; of close texture; *areolæ* oblong, narrow.

Inflorescence monoicous.

Capsule unsymmetrical, suberect, on a rather long pedicel, oval-oblong. *Lid* rostrate. *Annulus* obscure. *Calyptra* cucullate. *Peristome* double, as in *Leskea. Spores* small.

Perennial, growing on trunks of trees and on shady rocks.

This genus (named from ὁμαλος, *flat*, in allusion to the complanate leaves) is allied on the one hand to *Leskea* as to the capsule and peristome, and to *Neckera* in the foliage, especially to *Neckera complanata*, which is scarcely separable from *Omalia* in the foliage, and has almost the same peristome. Some of the species referred by Bridel to *Omalia* belong to quite different genera.

428. *Omalia trichomanoides* Dill., Schreb. (*blunt Fern-like Feather-Moss*); stem irregularly pinnate; leaves complanate, subsecund, oval-oblong, falciform, rather obtuse, serrulate at the apex, faintly nerved half-way; capsule suberect; lid rostrate. (TAB. XXIV.)

Omalia trichomanoides *Bridel*, Bryol. Univ. ii. 329. *Bryol. Eur.*

Hypnum trichomanoides *Schreb.* Fl. Lips. p. 88. *Turner. Smith*, Eng. Bot. t. 1493. *Hook. and Tayl.*

Leskea trichomanoides *Hedw.* Sp. Musc. *Schwaegr. Web. and Mohr. Moug. and Nestl.* n. 139. *Funck*, Deutsch. Moose, t. 35. n. 2. *Dill.* Musc. t. 34. f. 8.

Hab. Trunks of trees and on shady rocks. Fr. Oct., Nov.

Stems an inch long or more, subpinnate; branches elastic, curved downwards when dry. Leaves crowded, complanate, bending downwards when dry, dark green and glossy, of firm texture, faintly nerved half-way, areolæ elliptic-oblong. Perichætial leaves nearly erect. Fruitstalk $\frac{3}{4}$ inch long, reddish, slender. Capsule yellowish-brown. Lid obliquely rostrate, nearly as long as the capsule. Outer peristome yellowish-brown, the teeth as in *Hypnum*; inner peristome yellow, divided half-way down into 16 carinate segments, without intermediate cilia. Spores small. Inflorescence monoicous.

85. NECKERA *Hedwig.*

NECKERA (Distichia) *Bridel.*

Stems pinnate, from a creeping rhizoma, rigid and elastic, with descending stolons from the base.

Leaves complanate, disposed in eight rows ($\frac{3}{8}$), ovate-oblong, somewhat falciform, more or less obtuse, or acuminate, serrulate at the apex; nerveless, two-nerved at the base, or singly nerved half-way; generally undulated, glossy when dry; *areolæ* oblong, sinuous.

Inflorescence dioicous, or monoïcous. *Flowers* gemmiform, axillary.

Capsule erect, symmetrical; either immersed in the perichætium, or exserted on a pedicel varying in length; roundish-elliptical, or elliptic-oblong, smooth and of firm texture. *Annulus* none. *Lid* obliquely rostrate. *Calyptra* cucullate, rather large, sometimes slightly hairy. *Peristome* double; *outer teeth* linear-subulate, long, pale, scarcely trabeculate, connivent into a cone when moist, slightly geniculate and inflexed when dry; composed (as in *Hypnum*) of a double series of cellules, the outer series with a medial line; pale yellowish or reddish; *inner peristome* composed of 16 narrow carinate ciliary processes, usually shorter than the outer teeth and alternating with them, connected at the base by a very short membrane, fugacious, marked with a medial line. *Spores* rather large, smooth or granular.

Perennial, elegant mosses; growing on the trunks of trees and on shady rocks.

This very handsome genus (named by Hedwig in commemoration of *Necker*, a celebrated botanist who denied the existence of sexes in mosses) is here, and in the *Bryol. Europ.*, restricted to those species which have complanate and undulated foliage; *Distichia glabella* of Bridel being probably a species of *Omalia;* and *D. macropoda* of the same author a species of *Cylindrothecium. Neckera* is very closely allied to *Omalia;* and it may admit of a doubt to which of the two genera *N. complanata* should be referred, if *Neckera* be strictly limited to such species as have undulated leaves. The capsule in this genus is either immersed in the perichætium, or usually very shortly pedicellate.

a. Inflorescence dioicous.

9. 1. *Neckera complanata* Bryol. Eur. (*flat-leaved Neckera*); dioicous; stem pinnate; branches crowded, attenuated; leaves complanate not undulated, ovate-oblong, obtuse, apiculate, faintly two-nerved at the base; capsule roundish-elliptical, erect; lid rostrate. (TAB. XXIV.)

Neckera complanata *Bryol. Europ.*
Omalia complanata *Bridel*, Bryol. Univ. ii. 327.
Leskea complanata *Hedwig*, Sp. Musc., Fund. Musc. t. 10. f. 62—65. *Schwaegr. Web. and Mohr. Funck*, Deutsch. Moose, t. 35. n. 1. *Moug. and Nestl.* n. 328.
Hypnum complanatum *Linn.* Sp. Pl. 1588. *Dill.* Musc. t. 34. f. 7. *Turner. Smith*, Eng. Bot. t. 1492. *Hook. and Tayl.*

var. β. obtusa ; stems shorter, irregularly branched ; branches obtuse at the summit. *Turner. Bridel.*

Hab. On the trunks of trees, walls, &c.; var. β. on the ground. Fr. Nov., Dec.

Stem 1½ inch long or more, closely pinnate; branches short, attenuated. Leaves crowded, complanate, pale green, yellowish-brown when old, glossy when dry, obliquely ovate-oblong, apiculate, almost entire at the point, nerveless or faintly two-nerved at the base; areolæ narrower and longer than in the last. Perichætial leaves twice as long, erect. Fruitstalk about ¼ inch long, yellowish. Capsule roundish-elliptical, tapering below into the fruitstalk, erect, and symmetrical, with a small mouth, yellowish-brown, at length reddish. Outer teeth pale yellow, very narrow, almost straight when moist, slightly incurved when dry. Inner peristome very small, divided nearly to the base into 16 narrow processes. Lid obliquely rostrate, nearly as long as the capsule. Calyptra rather large, sometimes slightly hairy. A rudimentary annulus is observable.

Essentially distinguished from *Omalia trichomanoides* by the dioicous inflorescence.

430. 2. *Neckera crispa* Dill., Hedw. (*crisped Neckera*); stems pinnate; leaves complanate, ovate-oblong, apiculate, faintly one or two-nerved at the base; capsule on an elongated fruitstalk. (Tab. XXII.)

Neckera crispa *Hedwig*, Sp. Musc., Fund. Musc. ii. t. 14. *Turner. Smith. Schwaegr. Web. and Mohr. Swartz. Moug. and Nestl.* n. 429. *Funck*, Deutsch. Moose, t. 34. n. 2. *Hook. and Tayl.*
N. (Distichia) crispa *Bridel*, Bryol. Univ. ii. 247.
Hypnum crispum *Linn.* Sp. Pl. 1589. *Dill.* Musc. t. 36. f. 12. *Eng. Bot.* t. 617.

Hab. On rocks in mountainous districts, especially such as are calcareous; sometimes on the trunks of trees. Fr. Nov., April.

Stems 4—6 inches long or more, growing horizontally from a creeping rhizoma, with descending stolons from the base, elastic and somewhat rigid, more or less pinnate; branches spreading, complanate. Leaves complanate, crowded, light green, glossy and undulated, ovate-oblong, or ovate-ligulate; rather obtuse, and obscurely apiculate; serrulate at the apex, faintly two-nerved at the base, or sometimes with a longer single nerve. Perichætial leaves lanceolate, erect, narrowly acuminate, nerved half-way. Fruitstalk nearly ½ inch long, thrice as long as the perichætium, wavy, pale, yellowish. Capsule erect, roundish-ovate, yellowish-brown. Lid obliquely rostrate, as long as the capsule or longer. Calyptra twice as long, dimidiate, often slightly hairy. Outer peristome with 16 slender teeth, converging into a cone when moist; slightly inflexed and geniculate when dry, scarcely trabeculated, pale yellowish; inner peristome half as long, with a distinct basilar membrane; the cilia very narrow and fugacious, marked with a medial line like the outer teeth. Spores greenish, granular. Inflorescence dioicous.

A barren, stunted variety, with incurved, almost circinnate stems and branches, and ligulate, falcato-secund leaves, is found on exposed rocks near the summits of the Breadalbane Mountains, and in other similar situations in Scotland and Ireland. It probably owes its characters to the cold exposed localities in which it grows.

431 3. *Neckera pumila* Hudson, Hedwig (*dwarf Neckera*); stem subpinnate, with short complanate branches; leaves complanate, ovate-oblong, apiculate or acuminate, serrulate, margin recurved, two-nerved at the base, slightly undulated; capsule elliptical, exserted on a short fruitstalk; lid with a short beak. (TAB. XXII.)

Neckera pumila *Hedw.* St. Crypt. iii. t. 20. *Smith*, Eng. Bot. t. 1443. *Schwaegr.* *Moug. and Nestl.* n. 429. *Bridel.* *Hook. and Tayl.*

Hypnum pennatum *Dickson*, Crypt. Fasc. 1. t. 1. f. 8.

Fontinalis pennata *Hudson*, Fl. Angl. p. 468. *Dill.* Musc. t. 32. f. 9., according to *Hooker and Arnott* [? *W.*]

Hab. On the trunks of trees, in woods; sometimes on rocks; not frequent; rare in fruit. Woods in Sussex. Abundant in the New Forest, Hants. At Inverary and Cleish, plentiful. Cheshire. Derbyshire. Fr. Oct., Nov.

Stems 1—2 inches long, with very short spreading branches, often bearing numerous slender flagellæ, slender. Leaves dark green, more obscurely undulated than in the preceding species, much crowded, ovate-oblong, or ovate, slightly concave, apiculate, or acuminate; sometimes cirrhoso-acuminate, or almost piliferous, serrulate, the margin distinctly recurved, two-nerved at the base or nerveless. Perichætial leaves shorter than in the preceding, erect. Fruitstalk less than twice the length of the perichætium, straight. Capsule elliptical, erect, the mouth rather small, reddish when quite ripe. Lid half as long as the capsule, rostellate. Calyptra smooth, twice the length of the lid, cucullate, yellowish. Peristome reddish; inner peristome with a distinct basilar membrane. Spores large. Inflorescence dioicous.

The smaller size of the plant, shortly pedicellate capsule, and the recurved margin of the leaf, are characters by which this species is easily distinguished from the preceding species. In a barren state, it is known from *Omalia complanata* by the undulated leaves. *Neckera pumila* of Wahlenberg is a very different moss, with almost simple stems, monoicous inflorescence, subexserted capsules, and leaves with plane margins. It is *Neckera oligocarpa* of Bruch and Schimper (*N. vaginata* Hooker MSS.), and is given as a variety of *Neckera pennata* in Drummond's *Musci Americani*, n. 161. It grows upon rocks in the northern parts of Europe and N. America.

b. Inflorescence monoicous.

432 4. *Neckera pennata* Hall., Linn. (*feathered Neckera*); stems pinnate, with complanate branches; leaves ovate-lanceolate, acuminate, subfalciform, nerveless, entire; capsule oblong, immersed in the perichætial leaves. (TAB. XXXIV.)

Neckera pennata *Hedw.* St. Crypt. iii. t. 19. *Schwaegr. Web. and Mohr. Moug. and Nestl.* n. 146. *Funck,* Deutsch. Moose, t. 34. n. 1. *Greville,* Scot. Crypt. Fl. t. 109. *Bridel. Hook. and Tayl.*

Hypnum pennatum *Haller,* Hist. St. Helv. t. 45. f. 2. *Gmel. Hoffm.*

Fontinalis pennata *Linn.* Sp. Pl. 1571. *Dill.* Musc. t. 32. f. 9. *Haller,* Enum. St. Helv. t. 3. f. 2. *Vaill.* Bot. Par. t. 27. f. 4.

Cryptopodia pennata *Röhling.*

Pilotrichum pennatum *Pal. Beauv.*

Hab. On trunks of trees; very rare in Britain. Found only in one place, on the lower part of the trunk of a beech-tree at Fotheringham, four miles south of Forfar, Scotland, *Mr. T. Drummond.* Colin Glen, near Belfast, 1849, *Mr. David Orr.* Fr. Spring.

Stems 2 inches or more in height, pinnate, of less robust habit than *N. crispa,* with more distinct and more spreading foliage; branches longer, complanate. Leaves complanate, the lateral ones spreading and somewhat falcate, all of them ovate-lanceolate and taper-pointed, pale glossy green, undulated, scarcely at all serrulate at the apex, nerveless, or sometimes obscurely two-nerved at the base. Perichætial leaves lanceolate-acuminate, nerveless, entire; loosely sheathing the immersed capsule, and overtopping it. Capsule oval-oblong, reddish-brown. Lid obliquely and shortly beaked, shorter than the capsule. Annulus none. Calyptra small, smooth, dimidiate, whitish. Outer teeth of the peristome narrow, internally trabeculate, converging into a cone when moist, inflexed when dry, pale yellow; inner peristome very short, obscure, and fugacious, mostly adherent to the outer teeth, and hence liable to be overlooked. Spores rather small. Inflorescence monoicous.

Sufficiently distinguished from the other British species by the immersed capsules, and by the inflorescence. *N. remota* of Bruch and Schimper, from Abyssinia, seems to be scarcely distinct, the leaves however are more widely spreading, more obtuse, and the capsule shorter. *N. Jamesoni* of Dr. Taylor, from the Andes of Quito, has the stem bipinnate, the capsule exserted, and the perichætium shorter. *N. Douglassii* of Hooker (in *Bot. Miscel.* t. 35.), from the west coast of North America, is very similar in habit to *N. pennata,* but has the capsule laterally exserted from a very long closely sheathing perichætium; the leaves ciliato-serrate at the apex, and the inflorescence dioicous. *N. intermedia* of Bridel is unknown to us, as a distinct species growing in Teneriffe, but specimens of a *Neckera* sent by Professor Jameson from the Andes of Quito, may be the same as Bridel's, having the leaves obtuse and mostly rounded at the apex, of firmer texture than in *N. pennata:* but Bridel describes his with the leaves very much undulated ; whereas they are very slightly so in the specimens from Quito, which have the capsules shorter than in *N. pennata*. *N. Menziesii*, from the west coast of North America, not figured in any work, is a very distinct species, with obtuse leaves nerved above half-way, immersed capsules, and dioicous inflorescence. (See Drummond's *Musc. Am.* n. 162.) *N. obtusata* of Montagne, is closely allied to *N. Menziesii ;* but we have seen only barren specimens. *N. scabridens* of C. Müller, from Chili, differs from *N. pennata* only very slightly in the structure of the peristome, and is a questionable species. A slender delicate variety of *N. pennata*, or perhaps an allied species, grows in Van Diemen's Land, with leaves more acuminated and with longer capsules. *N. oligocarpa* of Bruch and Schimp. differs from *N. pennata* in the smaller size and different habit ; having almost simple stems, with very numerous axillary flowers, very small, roundish, subexserted capsules, and shorter, crowded leaves.

The Dillenian synonym surely belongs to this species, and not to *N. pumila* ; for not only does the figure well agree, but Dillenius states that he had his specimen from Haller, who discovered the species. Bridel justly criticises the error of Pal. Beauvois in referring this moss, which has a smooth calyptra, to his genus *Pilotrichum.*

SUBORDER XXXIV. HOOKERIEÆ.

86. HOOKERIA *Smith.*

PTERYGOPHYLLUM *Bridel.*
HOOKERIA *Hook. and Tayl. Schwaegr.* (Suppl. ii. 2. p. 189.)

Stems procumbent, or suberect, irregularly and sparingly branched, or subpinnate ; *branches* complanate.

Leaves complanate, disposed in 8 rows ($\frac{3}{8}$), laterally spreading, the intermediate ones appressed, ovate, ovate-lanceolate, or lanceolate, entire or denticulate, often with a thickened border, mostly two-nerved, sometimes with a single nerve ceasing above the middle, or nerveless, reticulated ; *areolæ* usually large, rhomboid, or elongato-hexagonal, at first filled with chlorophyll.

Inflorescence usually monoicous.

Capsule ovate or elliptical, horizontally cernuous or drooping, of thick succulent texture, on a succulent elongated fruitstalk. *Lid* rostrate, with a straight beak. *Annulus* obscure, or wanting. *Calyptra* campanulate-subulate, entire, or many-parted at the base, smooth. *Peristome* double ; *outer teeth* 16, nearly as in *Hypnum*, but in some of the species marked externally with two red prominent longitudinal ridges, internally trabeculated, incurved when dry ; *inner peristome* a membrane divided half-way down into 16 carinate processes without intermediate cilia. *Spores* small.

Perennial, succulent mosses, growing in wet shady places on the ground, and on rocks and trunks of trees.

This genus, though allied to *Hypnum*, is very distinct in habit, and is essentially characterised by the mitriform calyptra. The leaves are in most of the species loosely reticulated, and have usually a double nerve. In the structure of the peristome, it is allied to *Lepidopilum* of Bridel; to which genus indeed some of the reputed species with undulated leaves, suberect capsules, and chaffy calyptræ (e. g. *Hookeria Grevilleanum* of Dr. Taylor), should be referred, while others appear to belong to *Actinodontium* of Schwaegrichen, having suberect capsules, the outer peristome widely spreading, and the inner one divided almost or quite to the base into carinate processes. We propose here to limit the genus *Hookeria*, as circumscribed by Bridel under a different name (he having misapplied the name *Hookeria* to *Tayloria splachnoides* of Schwaegrichen and Hooker), not disturbing the Bridelian genera *Chætephora* (with subgenus *Eriopus*) and *Cyathophorum*, to which some reputed species of *Hookeria* have been removed, and leaving it to future investigation to determine the actual range of the genus.

433. 1. *Hookeria lucens* Dill., Linn. (*shining Hookeria*); stem procumbent, compressed, irregularly branched; leaves complanate, roundish-ovate, obtuse, entire, nerveless. (TAB. XXVII.)

Hookeria lucens *Smith,* in Linn. Trans. v. 9. p. 276. *Eng. Bot.* t. 1902. *Hooker and Taylor.*
Hypnum lucens *Linn.* Sp. Pl. 1589. *Dill.* Musc. t. 34. f. 10. *Hedw.* Sp. Musc. *Turner. Smith,* Fl. Brit. *Moug. and Nestl.* n. 40.
Leskea lucens *Decandolle. Schwaegr.* Suppl. t. 84. *Funck,* Deutsch. Moose, t. 35. n. 3.
Pterygophyllum lucens *Bridel,* Bryol. Univ. ii. 343. *Bryol. Europ.*

Hab. Moist banks in woods, and among rocks. Fr. Nov., Dec.

Stems 1—3 inches long, irregularly and sparingly branched, succulent and brittle; branches complanate. Leaves complanate, imbricated, pale shining green, roundish-ovate, obtuse, entire, nerveless; areolæ large, oblong-hexagonal. Perichætial leaves small, not covering the vaginula, ovate-lanceolate. Fruitstalk thick and succulent, about an inch long, geniculate at the base, wavy, smooth, reddish. Capsule elliptical; more or less drooping, or pendulous; of thick succulent texture. Annulus obscure, breaking off in fragments. Lid nearly as long as the capsule, with a straight beak. Calyptra conico-campanulate, covering the lid and a portion of the capsule, composed of 3—5 concentric layers of cellules. Outer teeth inflexed when dry, reddish-brown, strongly and prominently trabeculate internally, marked on the back with a medial line; inner peristome with the rudiments of cilia between the carinate processes. Spores green, rather small. Inflorescence monoicous.

The only exotic species which is liable to be confounded with this is *H. acutifolia*, which has the leaves narrower and acute. The fruitstalk is not simply inserted into the vaginula, but is closely and organically blended with it, contrary to the usual rule noticed by Mr. Valentine. The chlorophyll of the leaves when dry, contracts into a wavy riband-like ring. The lower leaves are not unfrequently rooted at the apex.

434. 2. *Hookeria læte-virens* Hooker and Taylor (*deep-green Hookeria*); stem procumbent, subpinnate; leaves complanate, loosely imbricated, ovate-acuminulate, with a narrow thickened border, doubly nerved above half-way, serrulate at the apex, slightly undulated when dry. TAB. XXVII.)

Hookeria læte-virens *Hook. and Tayl.* Musc. Brit. ed. 1. and 2. *Schwaegr.* Suppl. t. 163.

Hookeria albicans *Taylor*, in Fl. Hib. ed. 2. pt. 2. p. 36. (not Leskea albicans *Hedw.*).

Pterygophyllum læte-virens *Bridel*, Bryol. Univ. ii. 350.

Hab. In shady places by rivulets, in caves, and on wet rocks. Dunscombe's Wood, near Cork, *Mr. James Drummond.* Turk Waterfall, and O'Sullivan's Cascade, near Killarney, *Dr. Harvey and Dr. Taylor.* Cave at Mousehole, near Penzance, *Mr. Ralfs.* Fr. Nov., Dec.

Stems an inch long and more, with more slender and more numerous branches than in the preceding species, subpinnate. Leaves much smaller, deep green, not glossy, somewhat undulated when dry, loosely imbricated, complanate, the lateral ones widely spreading and slightly falciform, ovate, or elliptical, shortly acuminated, serrulate at the apex, the margin thickened; doubly nerved considerably more than half way; areolæ hexagonal, much smaller than in *H. lucens.* Perichætial leaves attenuated, erect, longer than the stem-leaves. Fruitstalk about an inch long, slender, reddish, smooth. Capsule small, drooping, elliptical, yellowish or reddish-brown, purplish at the mouth. Lid as long as the capsule, with a straight beak. Calyptra conico-subulate, covering only the beaked part of the lid. Outer teeth with two very prominent, reddish, semicylindrical ridges on the back, separated by a deep furrow of a yellow colour. Spores green, of the same size as in *H. lucens.* Inflorescence monoicous.

Notwithstanding the opinion to the contrary expressed by the late Dr. Taylor, we think *Leskea albicans* of Hedwig (*Sp. Musc.* t. 54.) ought not to be confounded with this. We have always found the leaves of that species more obtuse, with considerably larger areolæ; and the habit so different that few persons, seeing them in a dried state, would suppose them to be the same species.

The structure of the outer teeth of the peristome of this moss is characteristic of the genus; but in *H. lucens* the two dorsal ridges are confluent, and scarcely more prominent than in some species of *Hypnum.* To observe them satisfactorily it is necessary to make thin transverse sections under the microscope. It will then be seen that the two dorsal ridges are as thick as the yellow inner portion of the tooth, which is formed of two distinct layers of cellules.

87. DALTONIA *Hook. and Tayl.* *Bridel.*

DALTONIA (partly) of *Muscol. Brit.*
HOOKERIA *Hooker*, in Brit. Flora.

Stems erect, tufted, sometimes radiculose, branched ; *branches* fastigiate.

Leaves more or less spreading every way, disposed in five or eight rows ($\frac{2}{5}$ or $\frac{3}{8}$), lanceolate or linear-lanceolate, carinate or flattish, entire, with a thickened cartilaginous border ; *nerve* single, extending nearly or quite to the apex ; *areolæ* rhomboid, not large.

Inflorescence synoicous, or monoicous.

Capsule suberect, on an elongated roughish fruitstalk, oval-oblong, or oval, obscurely apophysate. *Lid* rostrate, with a straight beak. *Calyptra* conico-mitriform, densely ciliated at the base. *Annulus* none. *Peristome* double ; *outer* teeth 16, narrow, erecto-patent when moist, incurved when dry, marked with a medial line, slightly trabeculate ; *inner peristome* divided almost to the base into 16 narrow carinate processes as long as the outer teeth. *Spores* small.

Perennial mosses, growing in dense tufts, on moist shady rocks, in mountainous districts, and occasionally on the stems and branches of trees and shrubs.

This genus, named in honour of the late Rev. James Dalton, an excellent cryptogamic botanist, as limited by *Bridel* (to the exclusion of *D. heteromalla*), appears to constitute a well defined group, allied to *Hookeria*, but distinguished by the erect capsules, quaquaversal leaves, deeply divided inner peristome and spreading outer teeth. The ciliated calyptra does not effectually distinguish the two genera, being found in several species of *Hookeria*, or at least in some mosses which can scarcely be included in the genus *Daltonia* without detriment to the other assigned characters. Of the genus *Daltonia*, as here understood, we have about four species, only one of which is a native of Europe.

435. *Daltonia splachnoides* Hooker and Taylor (*Irish Daltonia*) ; synoicous ; stems tufted, erect, with fastigiate branches ; leaves crowded, erecto-patent, linear-lanceolate, acuminate, subcarinate, the nerve ceasing below the apex ; capsule oval-oblong, suberect, slightly apophysate ; fruitstalk roughish ; outer teeth perforated along the medial line. (TAB. XXII.)

Daltonia splachnoides *Hook. and Tayl.* Musc. Brit. ed. 1. p. 80. ed. 2. p. 139. *Bridel*, Bryol. Univ. ii. 255. *Schwaegr.* Suppl. t. 295. *Bryol. Europ.*

Neckera splachnoides *Smith*, Eng. Bot. t. 2564. (not of *Schwaegr.*).

Hookeria splachnoides *Hooker*, in Brit. Flora. *Taylor*, in Flor. Hib.

Hab. Moist shady rocks, and on trees, &c. in subalpine districts. Secawn Mountain, near Dublin, *Dr. Taylor.* Turk Mountain and Cromagloun Mountain, near Killarney, 1829, *W. Wilson.* Near the summit of Brandon Mountain, Ireland, *Mr. D. Moore.* Fr. Oct., Nov.

Stems about ¼ inch in height, densely tufted. Leaves crowded, suberect, dark green, glossy when dry, slightly keeled; the margin thickened, entire; nerve ceasing much below the apex; areolæ narrowly rhomboid, small. Perichætial leaves ovate, very small, scarcely covering the vaginula. Fruitstalk scarcely ⅓ inch long, roughish in the upper part. Capsule small, oval or oval-oblong, slightly apophysate, dark purplish-brown. Lid nearly as long as the capsule, with a straight beak, yellow. Calyptra conico-mitriform, densely ciliated at the base (the fringe formed of several rows of filiform processes), covering little more than the lid. Outer teeth pale yellow, long and narrow, spreading when moist, perforated along the medial line; inner peristome divided to the base into 16 carinate processes as wide as the outer teeth. Spores small. Inflorescence either synoicous, or sometimes monoicous.

The exotic species are as follows: *Hookeria* (*Daltonia*) *nervosa* Hook. fil. and Wils., from Lord Auckland's Islands, with wider carinate leaves, nerved at the apex; capsule and calyptra longer; lid shorter; inner peristome almost as in *Hookeria. D. ovalis* Taylor, from the Andes of Quito, with more carinate and more acuminate leaves than in *D. splachnoides*, and a larger subpyriform capsule. *D. Jamesoni* Taylor, from the same place, with plicato-carinate, loosely reticulated leaves. *Actinodontium ascendens* of Schwaegrichen, *Suppl.* t. 174., agrees with *Daltonia* in the calyptra and peristome, but the leaves have a double nerve, and are without any thickened border. The calyptra figured by Schwaegrichen, according to our specimens, appears to be imperfect.

SUBORDER XXXV. CRYPTOTHECEÆ.

88. CRYPHÆA *Mohr, Bridel.*

DALTONIA (partly) *Hooker and Taylor.*
NECKERA *Hedwig, Smith, &c.*
PILOTRICHUM *C. Müller.*

Stems growing from a creeping rhizoma, more or less pinnate, with stolons from the base.

Leaves imbricated in eight rows, spreading, appressed when dry, ovate-acuminate, entire, nerved half-way or to the summit; *areolæ* roundish or oval, dot-like.

Inflorescence monoicous; *flowers* lateral, axillary, gemmiform.

Capsule immersed in the perichætial leaves, erect, oval-oblong or roundish. *Lid* conico-acuminate or rostellate. *Calyptra* conico-mitriform, small, smooth. *Annulus* dehiscent.

Peristome double; *outer teeth* 16, narrow, converging into a cone when moist; *inner peristome* divided almost or quite to the base into 16 carinate, narrow, almost filiform processes alternating with the outer teeth. *Spores* small.

Perennial mosses, growing on the trunks of trees; sometimes upon rocks.

The genus *Cryphæa* (from κρυφαιος, *hidden*, in allusion to the concealed capsule) is distinguished from all other mosses usually referred to *Neckera* by the mitriform calyptra, and from *Neckera*, as limited in this work, by the different form and direction of the leaves, as well as by the whole habit, which approaches to that of *Fontinalis. Cryptotheca* of Hornschuch MS. appears to differ from *Cryphæa* only in the single peristome, and perhaps both might without impropriety be included in one genus, bearing the name *Cryptotheca* to distinguish it more clearly from the phenogamic genus *Cryphia* of Brown (which is of older date than *Cryphæa*), including *Grimmia julacea* of Hornsch. in *Fl. Bras. Esenbeckia* of Bridel, *Bryol. Univ.* ii. 753., if not separated by the plicate serrated leaves, can scarcely be kept apart on the ground of the alleged difference in the structure of the peristome, so much relied on by Bridel in constructing the genus; and must assuredly be included in the family of *Cryptotheceæ*. The discrepancies between the peristomes of different species of *Hookeria* tend to show that *Esenbeckia* is a doubtful genus.

436. *Cryphæa heteromalla* Dill., Hedw. (*lateral Cryphæa*); stem decumbent, sparingly branched; leaves imbricated, spreading, broadly ovate, acute, concave, margin reflexed, nerved above half-way; perichætial leaves elliptic-oblong, cuspidate; capsules unilaterally inserted, oblong, immersed in the perichætium, subsessile; lid conico-acuminate. (Tab. XXII.)

Cryphæa heteromalla *Bridel*, Bryol. Univ. ii. 250. *Bryol. Eur.*

Neckera heteromalla *Hedwig*, St. Crypt. iii. t. 15. *Turner. Smith*, Eng. Bot. t. 1180. *Funck*, Deutsch. Moose, t. 34. n. 3. *Schwaegr.*

Daltonia heteromalla *Hooker and Taylor*, Musc. Brit. *Moug. and Nestl.* n. 732.

Fontinalis secunda *Linn. jun.* Meth. Musc. *Dicks.*

Sphagnum arboreum *Linn.* Sp. Pl. t. 1570. *Dill.* Musc. t. 32. f. 6.

Phascum repens *Huds.* Fl. Angl. 397.? *Withering. Hull.*

Pilotrichum heteromallum *C. Müller*, Syn. Musc. ii. 167.

var. β. aquatilis; stem elongated; leaves roundish-ovate, rather obtuse, with plane margins.

Cryphæa *v.* Daltonia Lamyana *Montagne*, Ann. Nat. Sc. ser. ii. vol. vi. p. 327. t. 18.

Pilotrichum heteromallum β. aquatile *C. Müller*, Syn. Musc.

Hab. Trunks of trees; rare in Scotland. Near Forfar and near Callander. Var. β. on stones in running water, and on the stems of trees, occasionally overflowed, in the River Dart, above Hood Bridge, near Totness, Devon, *Rev. Mr. Tozer.* Banks of the Taw, Devon, *Rev. C. A. Johns.*

Stems from a creeping rhizoma, about 1 inch long, decumbent, the lower part bare of branches, sparingly branched above, scarcely pinnate; branches subfasciculate. Leaves widely spreading, slightly recurved, appressed when dry, yellowish dull-green, widely ovate; acute, scarcely acuminate, entire; slightly concave, with the margin recurved in the lower part; the nerve thick and of equal breadth throughout (or thickened upwards in the perichætial leaves), extending far beyond the middle, not unfrequently placed nearer to one side of the leaf than to the other; areolæ roundish-oval, dot-like, the walls of the cellules composing the leaf being very thick in proportion to their internal cavity, as is usual in all mosses with dotted areolæ. Perichætial leaves longer than those of the stem, elliptic-oblong; suddenly acuminated, or obtuse, with a long point formed by the thickened excurrent nerve, erect and sheathing, pale and membranous in the margin, their points overtopping the fruit. Capsules numerous, or clustered; inserted on the upper side of the stem and branches, so as to appear secund; oblong, immersed, very shortly pedicellate, yellowish-brown. Annulus deciduous, large. Lid conico-acuminate, yellow, half as long as the capsule. Calyptra reddish-brown, roughish, mitriform, covering the lid. Peristome almost white; outer teeth linear-lanceolate, attenuated, erect, scarcely trabeculated, granular, marked with a medial line; inner peristome half as long, with 16 narrow processes, alternating with the teeth, united by a short membrane at the base. Spores small. Inflorescence monoicous.

The var. β., growing in running water, is of much more robust habit, and has the stems 3 or 4 inches long, with foliage of a more lurid colour. Leaves larger than in the ordinary state of the species, of firmer texture, roundish and more obtuse, less concave, not at all reflexed in the margin; areolæ smaller and more dense; capsules shorter; vaginula longer; lid obliquely rostellate; peristome shorter; spores twice as large. We are unable to distinguish it as a species from *C. heteromalla.* The floating stems and immersed capsules give the plant very much of the aspect of *Fontinalis.*

Several exotic species are closely allied to this, differing more in habit than in character; e. g. *Neckera filiformis* of Swartz, *Fl. Ind. Occident.*; *N. sphærocarpa* Hooker; both belonging to this genus. *Neckera producta* of Hornschuch, closely resembling *Cryphæa filiformis* in habit, is essentially different in the hairy dimidiate calyptra and exserted capsule; and belongs either to the Bridelian genus *Pilotrichum*, or to *Leptodon.*

SUBORDER XXXVI. FONTINALEÆ.

89. FONTINALIS *Dillenius.* Water-Moss.

FONTINALIS (partly) of *Hooker and Taylor.*

Large, floating, pleurocarpous mosses; rooting at the base only, by which they attach themselves to stones and roots of trees in water.

Stems filiform, weak and flexible, somewhat fragile, irregularly or (in one species) bifariously branched; *branches* fasciculate; the lower part of the stem denuded of leaves.

Leaves disposed in three rows ($\frac{1}{3}$), more or less crowded, semiamplexicaul, ovate-acuminate, or ovate-lanceolate, complicato-carinate, or concave and rounded at the back, nerveless, entire; *areolæ* narrowly rhomboid, uniform in all parts of the leaf.

Inflorescence dioicous. *Flowers* lateral, among the leaves, gemmiform; *barren flower* small, narrowly ovate. *Antheridia* oblong, slightly exserted, with paraphyses, not numerous. *Archegonia* slightly exserted, 4 together, small, with paraphyses, surrounded by roundish-obtuse involucral scales.

Capsule immersed in the closely imbricated and sheathing perichætium, subsessile, ovate or oval; the pedicel bulbed in the interior of the vaginula, to which it closely adheres. *Lid* conical, tapering. *Calyptra* conical, crenated or slightly lacerated at the base, covering very little more than the lid, subcoriaceous. *Annulus* none. *Peristome* double; *outer teeth* 16, equidistant, linear-subulate, very long, cohering at the apex in pairs, each pair slightly twisted and incurved when dry, slightly spreading and recurved when moist, with numerous prominent trabeculæ internally; flattened and subcarinate externally, and marked with a medial line, bright red; *inner peristome* the sieve-like skeleton of a plicated cone, with sixteen salient angles, consisting of as many vertical, filiform cilia, united together by numerous horizontal cross-bars, and elegantly studded internally with projecting spurs, the remains of the contiguous cellules, coloured like the outer teeth. *Spores* small, round, smooth, greenish.

Perennial mosses, growing in water, mostly in rivulets.

The mosses belonging to this genus, which is allied to *Spiridens* and to *Cryphæa*, resemble the *Riparieæ* in the mode of growth and in general aspect; but they are larger, more slender and elongated, more copiously branched, and the capsules are always subaxillary and lateral. The flowers from which they originate, and also the branches, are inserted not strictly in the axillæ of the leaves (as in nearly all other mosses), but a little higher up, and sometimes even at the side of the next leaf above, as in *Sphagnum.* During the development of the fruit, the gemmiform flower is enlarged and elongated, and becomes a *perichætial* branch, the perichætium being composed of about four spires of imbricated leaves, distinguished from the stem-leaves by their larger dimensions and more firm texture; closely applied to the young capsule, and torn to shreds as it swells to its full size; they are inserted so high up that the vaginula in this genus seems to be almost wanting as a distinct organ, the upper part of the ramulus serving that office. The curious and extremely beautiful peristome should be examined in a recent state, before the lid is fallen away, in order to see it in perfection. If fine transverse sections of the somewhat unripe fruit are placed under the microscope, the structure of the peristome will be most advantageously exhibited; and its exquisite symmetry will much interest the observer.

Four species of *Fontinalis* are described in the *Bryologia Europæa*, of which only two are as yet known to grow in Britain. The other two are found in Sweden. Other species grow in North America, but are not yet sufficiently investigated. Named from the Latin, being an aquatic genus.

437 1. *Fontinalis antipyretica* Linn. (*greater Water-Moss*); stems with triquetrous foliage; leaves widely ovate-acuminate, complicato-carinate, the margin of one side reflexed; capsule oval, wholly immersed in the perichætium. (TAB. XXII.)

Fontinalis antipyretica *Linn.* Sp. Pl. 1571. *Hedwig*, Sp. Musc. *Turner. Smith*, Eng. Bot. t. 359. *Moug. and Nest.* n. 238. *Funck*, Deutsch. Moose, t. 58. n. 1. *Schwaegr. Web. and Mohr. Bridel. Hook. and Tayl. Br. and Schimper*, Monogr. fasc. 31. p. 5. t. 2. *Dill.* Musc. t. 33. f. 1.

Fontinalis trifaria *Voit.* in *Sturm*, Fl. Germ. Crypt.

Hypnum antipyreticum *Necker.*

Pilotrichum antipyreticum *C. Müller*, Syn. Musc.

Hab. In rivulets and stagnant waters; not unfrequent; abundant on wood by river banks; on stones in mountain rivulets, with *F. squamosa.* Fr. June, July.

Stems 1 foot long and more, much subdivided, the primary and secondary branches widely spreading and trifarious, (with the foliage) acutely triangular, the lower part of the stem bare of leaves. Leaves ovate-acuminate, and ovate-lanceolate, sharply keeled, almost doubled or complicate; all the leaves of the same branch with the margin reflexed on one and the same side, right or left; the other margin plane; entire, or obscurely denticulate at the apex; when young yellowish-green; when old olive or lurid-green; nerveless. Perichætial leaves obtuse. Capsules on the lower part of the older branches, numerous; each one immersed in the closely sheathing perichætium, the lid only being protruded; oval or ovate, with thick cellular walls, brown, slightly constricted below the mouth when dry. Lid narrowly conical, acute, half as long as the capsule, and covered by the calyptra of nearly the same size and shape. Peristome blood-red, outer teeth much trabeculated, the pairs of teeth tortuous and incurved when dry, or subcirrhose, when moist spreading in the upper half, erect below; inner peristome, a beautifully tesselated cone, scarcely longer than the outer teeth. Spores small, greenish.

The specific name of this moss is given in allusion to its being employed by the Swedes to fill up the spaces between the chimney and the walls, and thus to guard against accidents by fire, the moss possessing the peculiar property of not being inflammable.

Two varieties of this, if not distinct species, are found in Britain; one of them with more slender, fasciculate, not spreading branches and less complicated leaves; found near Dublin, and in Scotland; but we have not seen any specimen in fruit: it is probably *var. β. minor* of Bridel, and is sometimes mistaken for *F. squamosa*, from which the carinate leaves will always distinguish it. The other variety is a most elegant and curious state of the moss, resembling *F. gymnostoma* of Byrol. Europ., with distant, wide-spreading, broad, flaccid and transparent leaves, which are scarcely carinate, and are inserted on very slender reddish stems, with elongated branches: it was found, barren, by Dr. W. H. Harvey, in a spring-well flowing into the Suir, at Carig-a-taha, near Caher, in 1831; but on a subsequent search, only the common form of the species was seen in the same locality; hence we infer that it is only an accidental or possibly a young state of the plant.

The leaves of *Fontinalis antipyretica* are very frequently cloven along the sharp keel, and the two halves of the leaf are very much like two whole leaves of *Fontinalis squamosa*. From non-acquaintance with this fact the latter has been unnecessarily suspected (in *Muscol. Brit.*) to be a doubtful species. Both the species may be seen growing together, each with its proper characters, in the rivulet above the waterfall at Aber, Carnarvonshire. *F. antipyretica* is easily distinguished from all others of the genus by the sharply carinate leaves. The archegonia and antheridia are always more or less exserted beyond the involucral scales.

438. 2. *Fontinalis squamosa* Linn. (*alpine Water-Moss*); stems with numerous slender fasciculate branches; leaves oblong-lanceolate, or lanceolate, concave. (Tab. XXII.)

> Fontinalis squamosa *Linn.* Sp. Pl. 1571. *Dill.* Musc. t. 33. f. 3. *Hedwig*, St. Crypt. iii. t. 12. *Turner. Smith*, Eng. Bot. t. 1861. *Funck*, Deutsch. Moose, t. 58. n. 2. *Moug. and Nestl.* n. 430. *Schwaegr. Web. and Mohr. Bridel. Hook. and Tayl. Br. and Schimper*, Monogr. fasc. 31. p. 6. t. 3.
>
> Pilotrichum squamosum *C. Müller*, Syn. Musc.

Hab. In mountain rivulets, not common in fruit. In the rivulet above Aber Waterfall, N. Wales. In the stream below Lough Bray, Ireland, with fruit. Fr. June, July.

Stems shorter than in the last; with more numerous, crowded, fasciculate, not spreading, slender branches. Leaves dark or lurid green, crowded, erecto-patent, concave; rounded, not keeled at the back; the margin never reflexed, glossy when dry, lanceolate or ovate-lanceolate, only half as wide as in the preceding species, nerveless, entire. Perichætial leaves apiculate, subserrulate at the apex. Capsule and peristome very much like those of the preceding species. *Var. β. tenella*, of Bruch and Schimper, is more slender and lax, with distant smaller leaves, and smaller capsules. We have not observed it to grow in Britain.

F. squamosa is readily distinguished from *F. antipyretica* by the concave not carinate leaves, which are much smaller, and lurid green; the stems, also, are more slender, and the branches more numerous and fasciculate.

F. Dalecarlica, of Bryol. Europ., has longer acute perichætial leaves, overtopping the capsule and lid; outer teeth perforated along the middle, and more distantly and more prominently trabeculated; spores larger; capsule and lid smaller; habit more slender. *F. hypnoides* Bryol. Europ., in habit resembles *F. squamosa var. tenella*, having the stems very slender, with few spreading branches; leaves more spreading and lax, not appressed when dry, more loosely reticulated; capsule composed of larger cellules; teeth narrower, more closely trabeculated; inner peristome more tender; spores smaller. *F. disticha*, a North American species, of which only imperfect examples have been seen, has rigid stems, with the branches distichous and widely spreading; leaves distant, narrow, spreading; capsule subcylindrical; lid shortly conical.

90. DICHELYMA *Myrin.*

FONTINALIS (partly) of *Hooker and Taylor, &c.*

Aquatic pleurocarpous mosses, with the habit of *Fontinalis*, connecting that genus with the *Hypneæ.*

Stems rooting at the base only, floating freely in the water, irregularly or distichously branched, producing capsules on the stem and branches.

Leaves inserted in three rows, falcato-secund, or suberect, lanceolate, lanceolate-subulate, or subulate-setaceous, complicate-carinate, nerved, more or less serrulate; *areolæ* elongate-rhomboid or linear, diaphanous.

Inflorescence dioicous; *flowers* axillary, gemmiform; the full-grown *perichætium* very long and sheathing.

Fruit axillary. *Capsule* sometimes immersed in the long sheathing perichætium, sometimes exserted on a longer pedicel, erect, oval, small, its walls thin. *Calyptra dimidiate*, membranaceous, sometimes longer than the capsule, and clasping the top of the fruitstalk, sometimes shorter and cucullate. *Lid* large, conico-rostellate. *Annulus* none. *Peristome* double; similar to that of *Fontinalis*, but more fugacious and scarcely hygroscopic, and the inner one with very few cross-bars. *Spores* small.

The *Fontinaleæ* are connected with the *Hypneæ* through *Climacium* and *Spiridens;* the outer peristome of the latter and its sessile capsules, like those of *Fontinalis;* and *Dichelyma* resembling *Climacium* in the structure of the peristome, capsule, calyptra, and perichætium.

Dichelyma is named from διχαω, 'ἐλυμα, in allusion to the cloven calyptra. Four European species are described by *Bruch and Schimper.*

439. *Dichelyma capillaceum* Dickson (*bristly Water-Moss*) ; stem slender, with few widely spreading distichous branches ; leaves subulate-setaceous, falcate-secund, glossy, the nerve much excurrent ; perichætium longer than the capsule ; capsule pale, of thin texture ; teeth of the outer peristome perforated ; inner peristome connected only at the top with cross-bars. (Tab. XXII.)

Dichelyma capillaceum *Br. and Schimper,* Monogr. fasc. 31. tab. Suppl. 1. *Dill.* Musc. t. 33. f. 5.
Fontinalis capillacea *Dickson,* Crypt. Fasc. 2. p. 1. *Smith,* Eng. Bot. t. 2432. *Schwaegr. Bridel. Hook. and Tayl. Linn.* Fl. Suec. 962.
Neckera capillacea *C. Müller,* Syn. Musc.

Hab. Alpine rivulets, *Mr. Dickson.* Fr. Summer.

Stems 3—6 inches long, or more, slender, but rather rigid and brittle ; the branches few and widely spreading, either in two directions or turned to one side. Leaves more or less crowded, erecto-patent, secund, slightly falcate, dull green, glossy when dry, subulato-setaceous, carinate ; the nerve much excurrent, forming the upper attenuated portion of the leaf, which is not at all flaccid, nor much altered by drying ; areolæ narrow, elongated. Perichætial leaves very long, convolute, nerveless, overtopping the capsule, which protrudes laterally ; the inner perichætial leaf, like the long dimidiate membranaceous calyptra, spirally convolute. Capsule shortly oval, pedicellate, of thin texture, the mouth wide. Lid large in proportion to the capsule, conical or rostellate. Annulus none. Peristome large ; outer teeth almost linear, perforated along the medial line, with 12—15 articulations, tawny red, granulated, fragile and fugacious ; inner peristome composed of 16 narrower articulated cilia, perforated like the teeth, which they exceed in length, connected together at the top only by a few cross-bars ; elsewhere free, like the processes of the inner peristome of *Climacium*, papillose, with 15—20 joints, marked with a medial line, orange-red. Spores small. Inflorescence dioicous.

This species has long been supposed a dubious native of Britain. Barren specimens of *Blindia acuta*, accidentally growing in Loch Awe, have been given to us under the name of *Fontinalis capillacea*, and Dickson may have inadvertently substituted foreign specimens of the genuine plants. This moss, though not very unlike barren specimens of *Hypnum fluitans*, is easily distinguished by the more rigid leaves, with excurrent nerve : it differs also by the same character from *Dichelyma pallescens* of Bryol. Europ. (given as *D. capillaceum* in Drummond's *Musci Americani*, n. 234.), which has shorter, wider, more falcate and more sharply carinate leaves, with larger areolæ. *D. falcatum* of Myrin resembles *D. pallescens* in the foliage, which is, however, of a deep green colour ; and the capsule is exserted, having an inner peristome with more numerous cross-bars. *D. subulatum* of Bryol. Europ. has much shorter almost straight leaves, numerous short spreading branches, immersed capsules, and short calyptra, approaching in habit to *Fontinalis antipyretica:* beautiful specimens are published in Drummond's *American Mosses from the Southern States. Dichelyma capillaceum* was gathered abundantly by Mr. Drummond in British N. America; but he omitted to insert specimens in the *Musci Americani.* The only European habitat, besides Scotland, is the province of Westermann, Sweden. The species was not known to Myrin, and is probably very rare in Sweden, as it is in Britain. Dillenius had his specimen from Pennsylvania, given by Bartram.

GLOSSARY

OF

TERMS NOT IN COMMON USE.

Acranthi; terminal flowers.
Acrocarpi; terminal fructification.
Acuminate; more or less taper-pointed.
Acuminulate; shortly taper-pointed.
Adnate; joined together.
Androgynous; barren and fertile flowers on the same receptacle.
Annotinous; the last year's shoot, rendered visible by an interruption at the point of junction with the previous growth.
Antheridia; oblong vesicles containing spermatozoids, analogous to the anthers of flowering plants.
Apex; the upper extremity.
Apiculate; having a very short point.
Apiculus; short point.
Apophysate; with a swelling at the base.
Apophysis; swollen base of the capsule.
Appendiculate; with small spurs attached at intervals on the margin of the cilia of the inner peristome.
Archegonia; long-necked vesicles containing the rudiment of the fruit or capsule, analogous to the pistilla of flowering plants.
Arcuate; bent like a bow.
Areolæ; the small spaces bounded by the outline of the cellules of a leaf, &c.
Aristate; terminated by a short bristly point.
Articulate; jointed or marked with cross-bars.
Assurgent; pointing upwards.
Attenuated; reduced to a very narrow tapering point.
Barren flower; the flower containing antheridia.
Basal; }
Basilar; } at the base of the leaf or peristome.
Bifarious; two-ranked.
Bigeminate; doubly paired, or four together.
Bistriate; marked with two parallel lines.
Cæspitose; tufted, or matted together.
Calyptra; the outermost or topmost filmy covering of the capsule.
Campanulate; bell-shaped.
Capituli; small cluster-like heads or buds.
Capituliform; shaped like a small bud.
Capsule; the fruit, or vessel bearing the spores or seeds.
Carinate; keeled.
Cartilaginous; of hard close texture; not tender and succulent.
Caulescent; growing up into a stem.
Cauline; growing on the stem.
Cellules; the vesicles composing the substance of the leaf, &c.

Chlorophyll; green matter filling up the interior of the cellules.
Chromule; colouring matter in the interior of the cellules.
Cilia; hair-like divisions of the inner peristome.
Circinnate; bent almost into a circle.
Cirrhose; with a very narrow or hair-like wavy point.
Cladanthi; flowers terminating a lateral branch.
Cladocarpi; fruit terminating a lateral branch.
Clavate; club-shaped.
Columella; the central pillar round which the spores are placed within the capsule.
Comal; uppermost and largest leaves of a stem of *Bryum*, &c.
Complanate; flattened.
Confervoid; like a conferva, or thread-like.
Connivent; directed all towards a common point or centre.
Constricted; suddenly contracted in width, not at the extremity.
Cribrose; perforated with holes like a sieve.
Crisped; frizzled, or bent in various directions.
Crura; legs or divisions of a forked tooth.
Cupuliform; shaped like a dome.
Cuspidate; with a short bristly point.
Cuticular; belonging to the skin or outer surface.
Cyathiform; shaped like a drinking cup.
Dehiscent; falling loose, or separating spontaneously.
Dendroid; resembling a tree.
Dentate; toothed.
Denticulate; with small teeth.
Diaphragm; a dividing membrane or partition.
Dichotomous; forked, or with the branches in pairs.
Dimidiate; split along one side.
Dimorphous; of two different shapes.
Dioicous; barren and fertile flowers on distinct individuals.
Disciform; shaped like a flat disk or platter.
Dispositio (*disp.*); arrangement of leaves in spirals round the stem, usually of 8 leaves in 3 spires (disp. $\frac{3}{8}$), often of 5 leaves in 2 spires (disp. $\frac{2}{5}$), &c.
Distichous; inserted in two opposite rows.
Divaricate; widely spreading asunder.
Dorsal; at the back or outer face.
Equitant; inserted in two ranks, and the leaves of each rank partly sheathing each other at the base.
Erose; irregularly terminated, as if gnawed at the apex.
Excurrent; extending beyond the laminar portion of a leaf.
Falcate; shaped like a falchion, or considerably bent.
Farious, bi- tri- &c.; standing out in two, three, or more directions.
Fascicle; a bunch of leaves on a very short branch.
Fasciculate; with short lateral branches of unequal height.
Fastigiate; all the branches reaching an equal height.
Fertile flower; the flower with archegonia.
Filiform; thread-shaped.
Fissile; with a tendency to become split or divided.
Fimbriated; fringed, or with many marginal divisions.
Fugacious; soon falling away.
Fusiform; spindle-shaped.
Gemmæ; loose granular bodies, capable of becoming plants.
Gemmiform; shaped like a bud.
Geniculate; suddenly bent at an angle.
Granulated; roughish on the surface.
Granulose; resembling small grains.
Gregarious; growing in company, but not matted together.
Guttulate; composed of small, round, pellucid, dot-like vesicles.

Hygrometric; moving under the influence of moisture.
Hygroscopic; showing the presence of moisture by motion.
Imbricated; overlapping each other like tiles.
Immersed; covered over and concealed by the outer projecting parts.
Incrassated; thickened; suddenly thicker than the adjoining parts.
Indehiscent; not separating spontaneously.
Inflexion; a bending inwards.
Inflexed; bent inwards.
Inflorescence; the arrangement of the flowers.
Innovations; new growths, or supplementary extensions of the stem of a moss.
Internodes; intervals between the joints.
Involucral; belonging to the involucre or outer covering of a flower.
Julaceous; resembling a slender glossy worm.
Laciniæ; shreds.
Lacunose; perforated with large central holes.
Lamelliform; shaped like small laminæ.
Lamina; the substance of a leaf exclusive of the nerve; also the terminal appendage of the true leaf in *Fissidens*.
Lentiform; shaped like a lens or vetch-seed.
Lid; the covering of the mouth of the capsule, below the calyptra.
Ligulate; strap-shaped.
Lingulate; tongue-shaped.
Medial; along the middle.
Mitriform; mitre-shaped.
Moniliform; necklace-shaped.
Monoicous; barren and fertile flowers on the same plant, but not on the same receptacle.
Mucro; a short, narrow, terminal point.
Mucronulate; with a very short narrow point.
Multifid; many-parted for a portion of its length.
Muriculate; having the surface rough, with numerous sharp prominences.
Muticous; destitute of a slender point.
Naked flower; without an involucre, or floral leaves.
Navicular; shaped like a boat.
Nerve; the midrib of a leaf.
Nidulant; nestling; not organically or originally attached to the place of growth on or amongst the leaves.
Nodulose; thickened at intervals into knots.
Nucleate; with a central substance of greater density.
Ochrea; a filmy sheath terminating the vaginula and surrounding the base of the fruitstalk.
Octofarious; in eight directions.
Operculum; see *Lid*.
Pagina; the filmy portion of the leaf apart from the nerve.
Panduriform; fiddle-shaped.
Papillate; } rough, with small roundish prominences.
Papillose; }
Paraphyses; succulent jointed hair-like bodies growing mixed with the archegonia and antheridia.
Parenchymatous; composed of cellules applied end to end.
Pectinate; divided or branched like a comb.
Percurrent; extending throughout the entire length.
Perichætium; the leafy involucre at the base of the fruitstalk immediately surrounding the vaginula.
Perigonium; a barren flower, with involucral scales.
Peristome; the fringe of teeth, &c. at the mouth of a capsule, covered at first by the lid.
Persistent; not soon falling away.

Pleurocarpi; fructification from the side of a stem.

Plicæ; plaits or furrows.

Polygamous; barren and fertile flowers variously disposed on the same individual.

Predominant nerve; forming the chief part of the upper portion of a leaf, and insensibly passing into the laminar substance.

Processes; principal divisions of the inner peristome.

Proliferous; bearing young leafy shoots.

Prosenchymatous; composed of cellules whose ends overlap each other.

Punctulate; marked with small opaque dots.

Quadrate; square.

Quaquaversal; directed every way.

Quasi monoicous; seemingly, but not really monoicous.

Quinquefarious; in five directions.

Radicles; small rooting fibres.

Radiculose; covered with radicles.

Ramification; the arrangement of the branches.

Ramulus; a small branch.

Rhizoma; creeping subterraneous stem.

Rostellate; with a very short beak.

Rostrate; with a longer beak.

Scalpelliform; shaped like the blade of a penknife.

Semiamplexicaul; partially clasping the stem.

Semiterete; half cylindrical.

Seta; fruitstalk.

Scariose; dry and chaffy, as opposed to tender and succulent.

Setaceous; bristle-shaped.

Spermatozoids; active organised vesicles in the antheridia, analogous to the pollen of flowering plants.

Sporangium; the inner sac of the capsule immediately surrounding the spores.

Spores; the seed-like contents of the ripe capsule.

Stolons; long horizontal or descending shoots from the base of a stem.

Stomata; organic pores on the surface of a capsule, &c.

Secund; turned all to one side.

Strumose; with a goitre-like swelling at the base.

Sub-, in a slight degree; e.g. *Sub-serrate*, slightly serrate.

Surculus (pl. *Surculi*); a leafy upright shoot from the rhizoma.

Synoicous; antheridia and archegonia on the same receptacle.

Terete; cylindrical.

Thallus; confervoid or earliest stage of growth of a moss.

Thecal membrane; the cellular inner portion of the capsule, immediately surrounding the sporangium.

Tomentose; covered with down.

Trabeculate; with horizontal prominent cross bars on the inner face of the teeth of a peristome.

Turbinate; shaped like a peg-top.

Tumid; swollen.

Vaginula; the cellular sheath surrounding the base of the fruitstalk, once the lower portion of the archegonia.

Villi; jagged or branched leafy processes covering the stem amongst the leaves, distinguished from radicles by their shape and by their green colour.

Villous; covered with villi.

Uncinate; bent like a hook.

Unilateral; turned to one side.

Utricles of *Sphagnum*; oblong vesicles forming the external portion of the ramulus.

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THE GENERIC AND SPECIFIC NAMES.

The names printed in Italics are Synonyms, or Species incidentally noticed; those in Roman Capitals are the Genera.

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GENERAL REFERENCE TO THE FIGURES OF SPECIES ADDED SINCE THE PUBLICATION OF THE SECOND EDITION OF "MUSCOLOGIA BRITANNICA."

Fig. 1.	Natural size of the plant.
Fig. 2.	The stem, or a portion of it, magnified about 10 diameters.
Fig. 3.	Leaf, detached, magnified 10 times.
Fig. 4.	Leaf, magnified 40 times.
a. l.	Apex of leaf.
b. l.	Base of leaf.
m. l.	Margin of leaf.
s. l.	Section of leaf, magnified 40 times.
st. l.	Stem leaf.
br. l.	Branch leaf.
f.	Fringe, or peristome.
v.	Veil, or calyptra, magnified, usually, about 10 times.

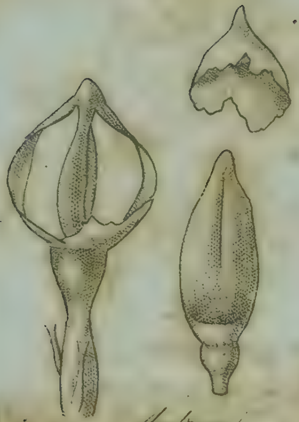
In a few instances are given magnified figures of dissections as seen under a doublet lens of $\frac{1}{20}$ in. focus.

In some cases it was necessary to reduce the size of the figures, to bring them within the required space; but usually the magnified figures represent the object either 10 or 40 times larger in diameter than the actual size.

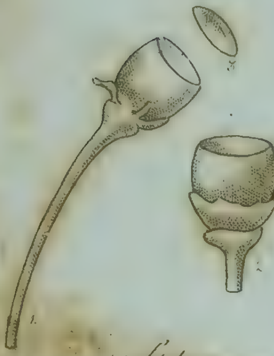
London:
A. and G. A. Spottiswoode,
New-street-Square.

Tab 1

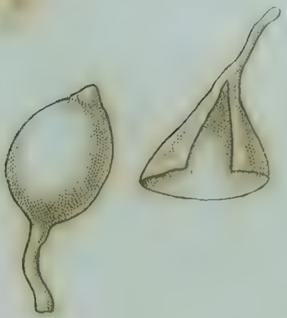
GENERA.



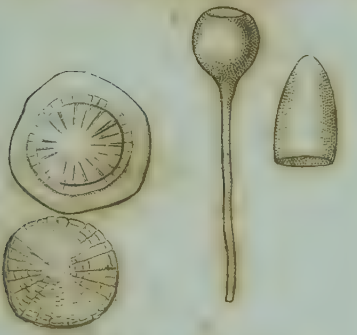
Andraea



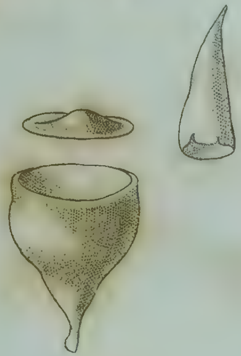
Sphagnum



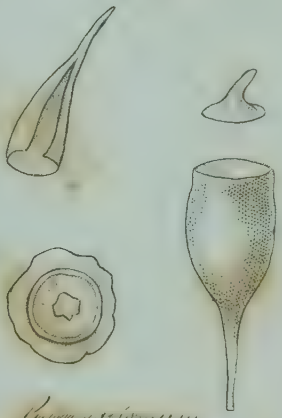
Phascum



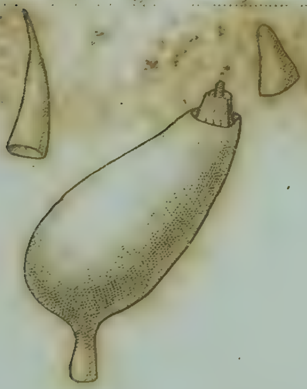
Schistostega



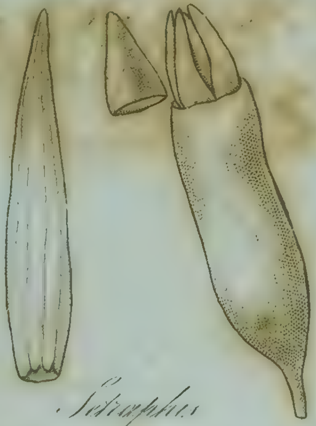
Anictangium



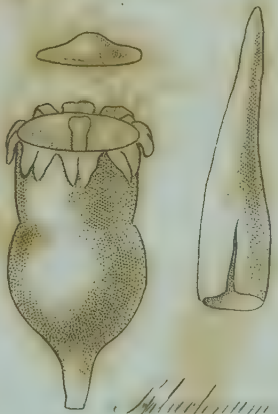
Gymnostomum



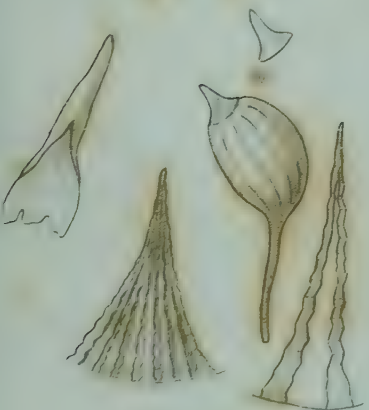
Diphyscium



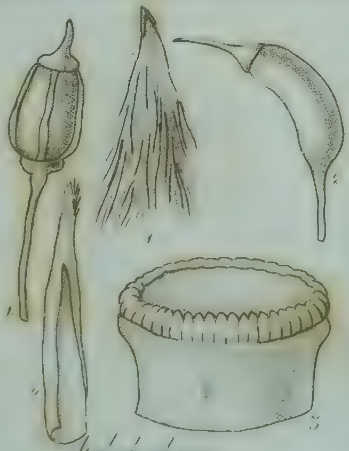
Tetraphis



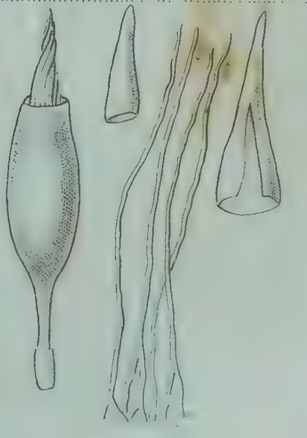
Splachnum



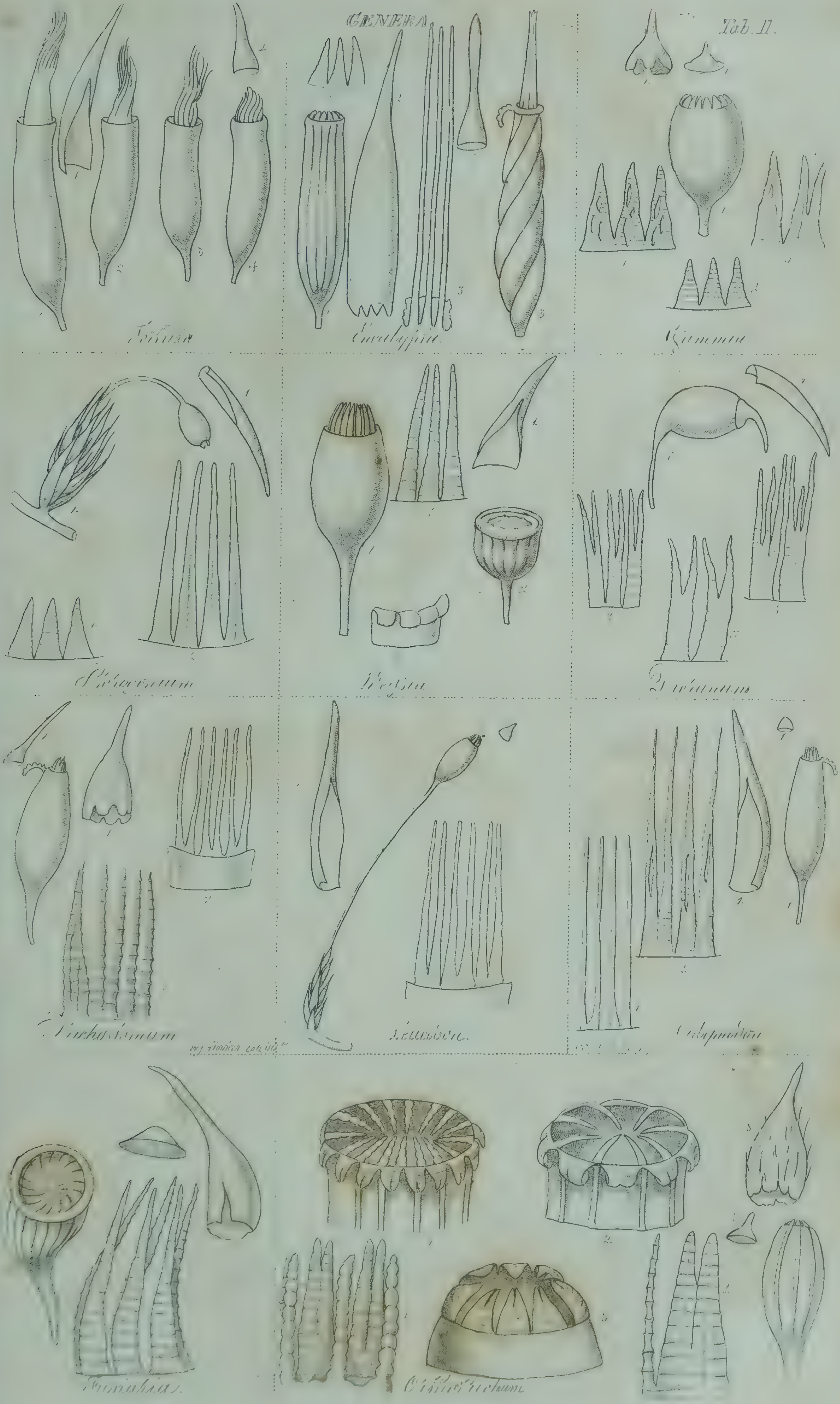
Orthotrichum



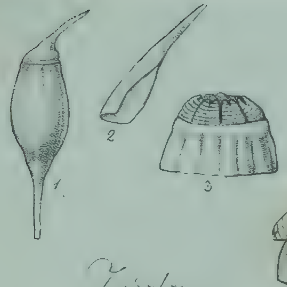
Polytrichum



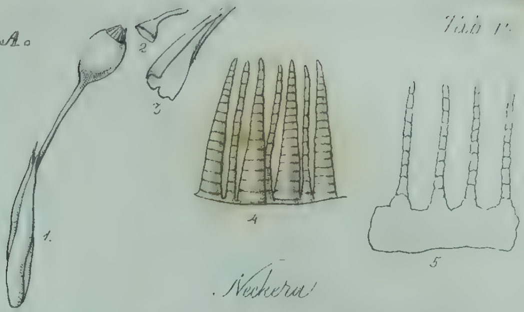
Cinclidium


GENERA
Tab. II.
Tortula
Encalypta
Grimmia
Pterogonium
Weisia
Dicranum
Trichostomum
Leucodon
Calypodon
Funaria
Orthotrichum

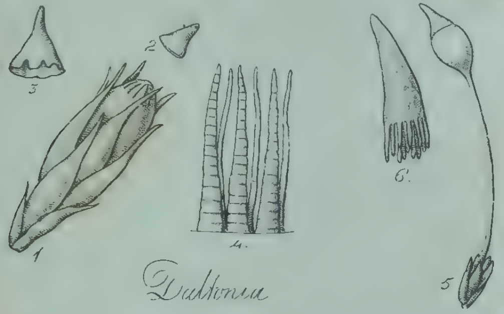
GENERA.



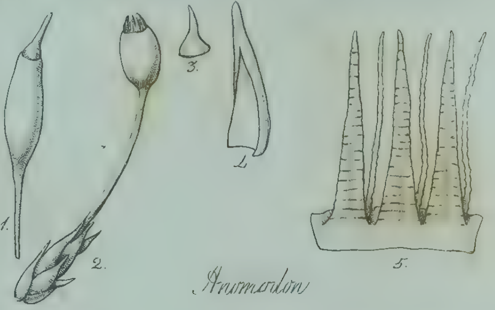
Zygodon



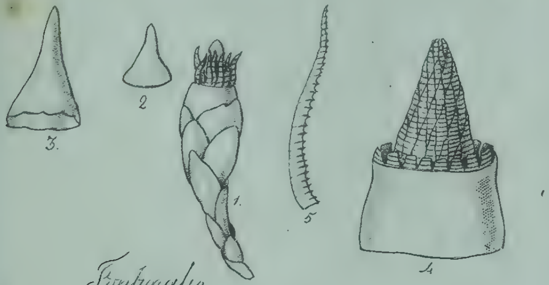
Neckera.



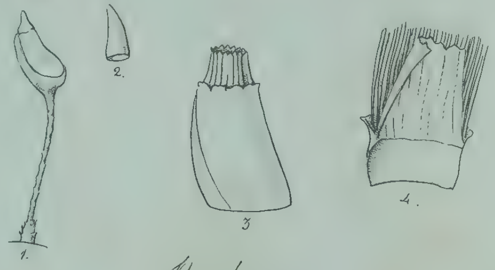
Daltonia



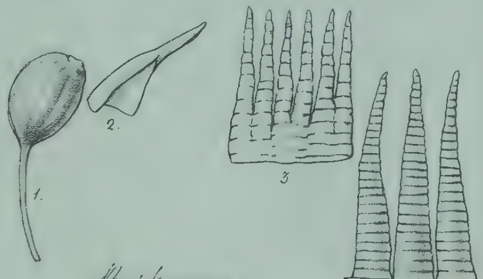
Anomodon



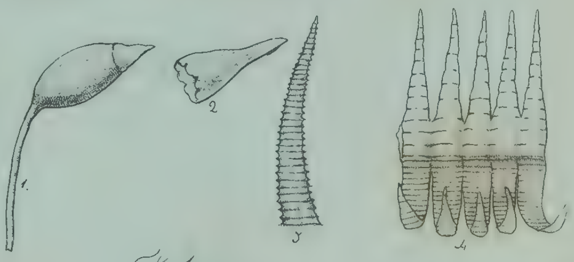
Fontinalis



Buxbaumia.



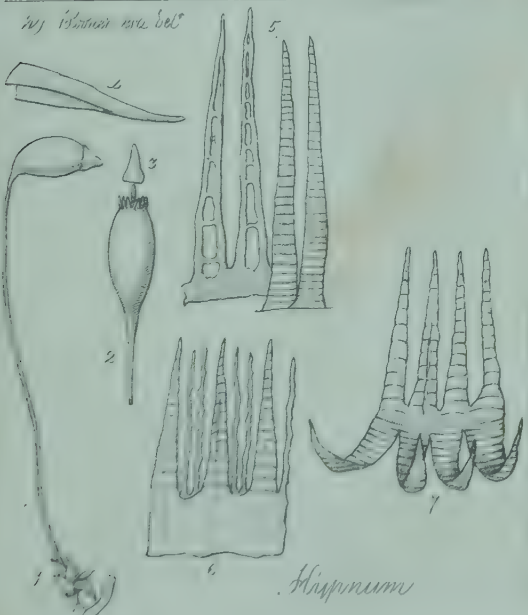
Bartramia.



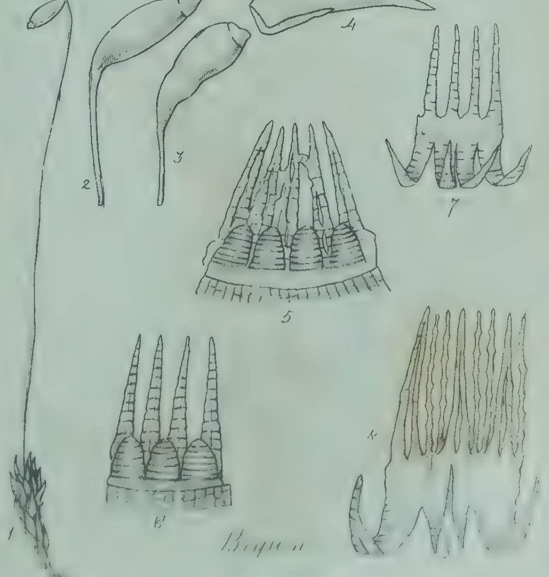
Hookeria

Wm Brown esq. Del.

Edwards. Sc.



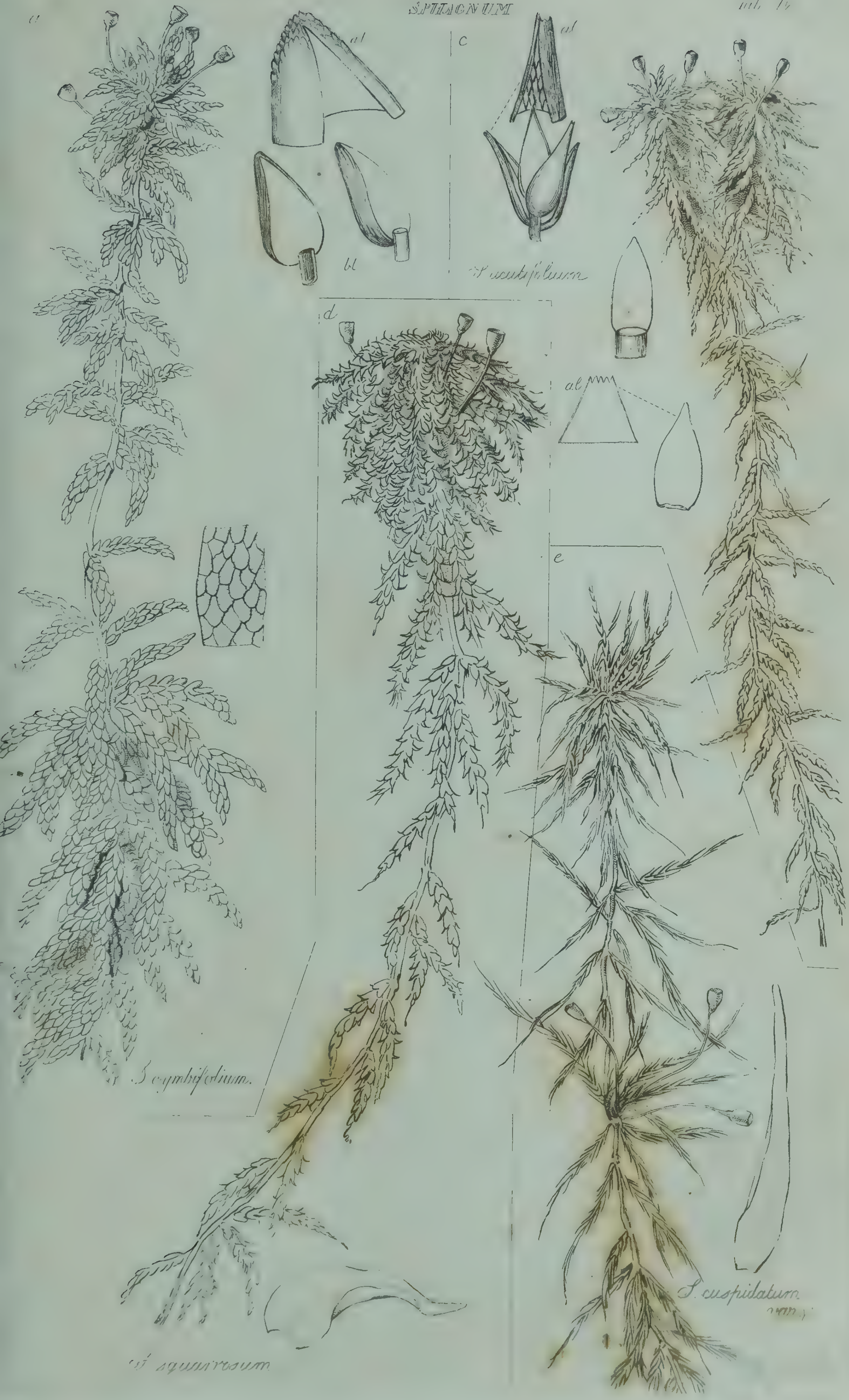
Hypnum

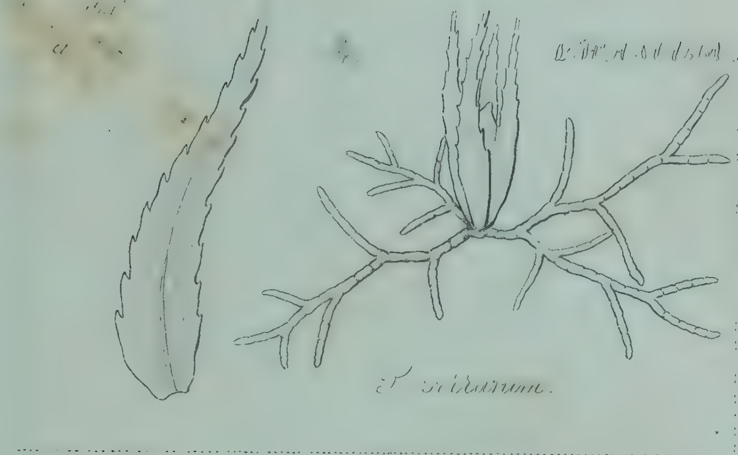


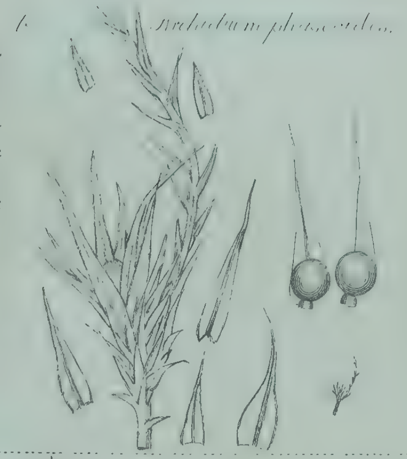
Bryum

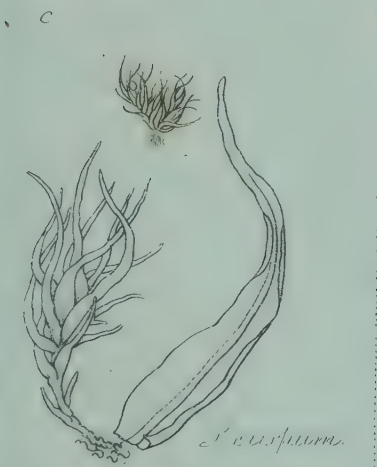
SPHAGNUM

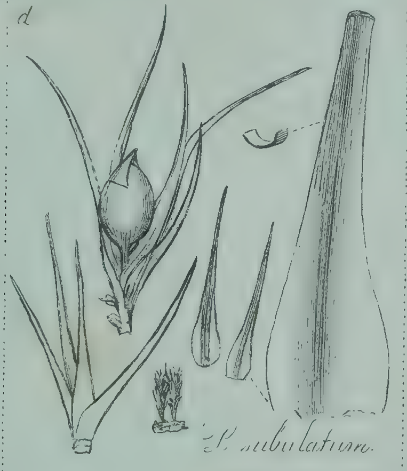
tab. 14

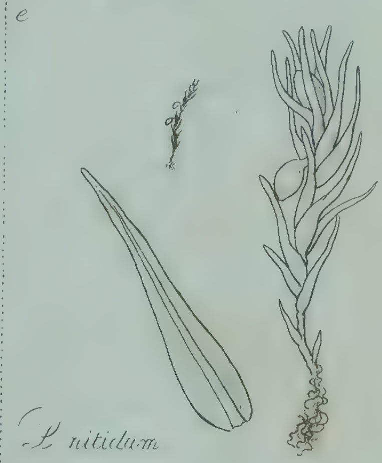


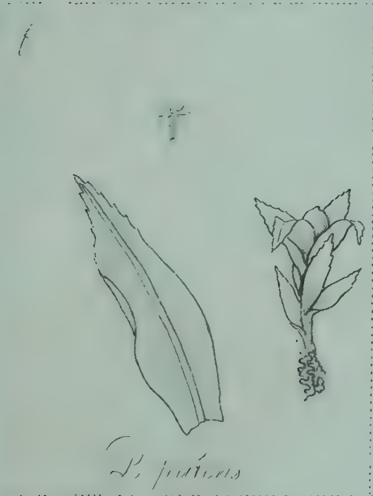

a
P. serratum.

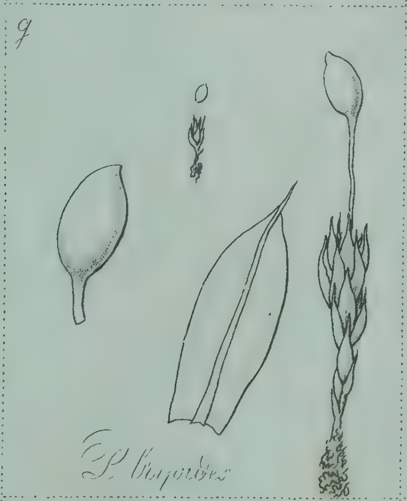

b
Archidium phascoides.

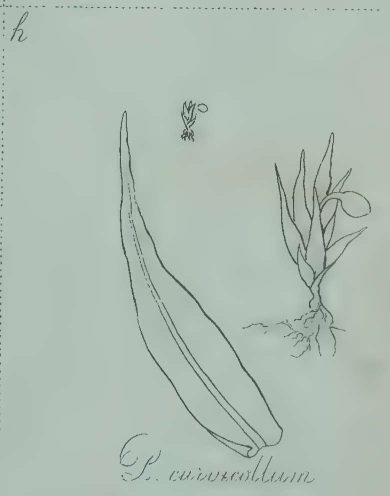

c
P. crispum.

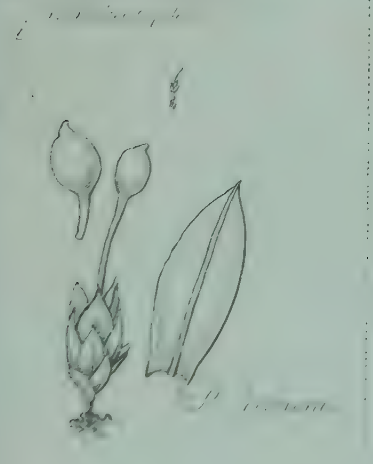

d
P. subulatum.

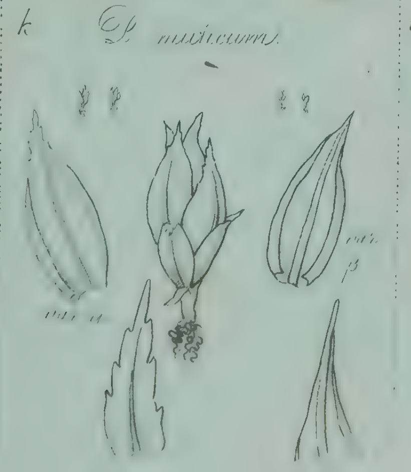

e
P. nitidum

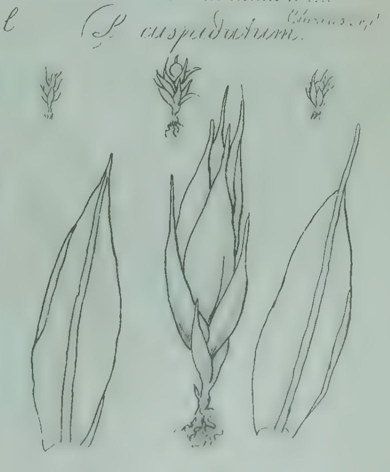

f
P. patens


g
P. bryoides


h
P. curvicollum

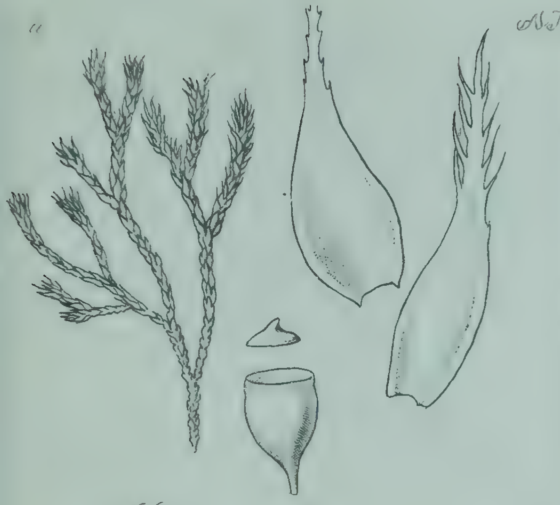

i


k
P. muticum.
var. α
var. β

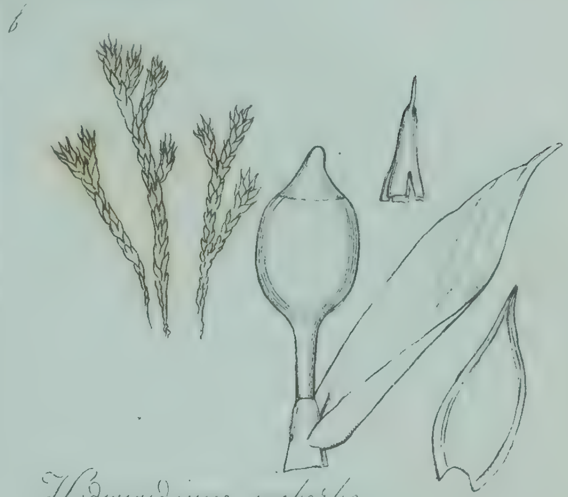

l
P. cuspidatum.

ANICTANGIUM.

Tab. 11

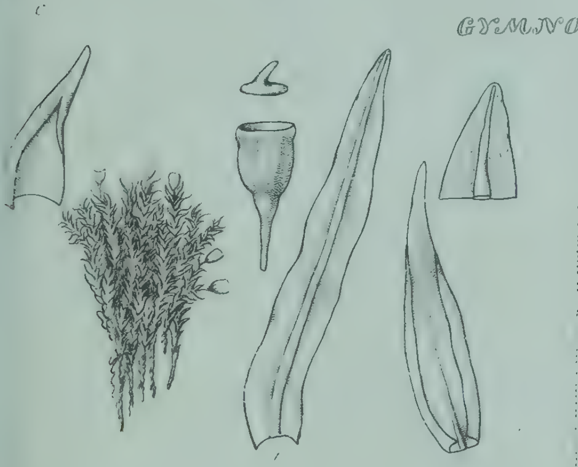


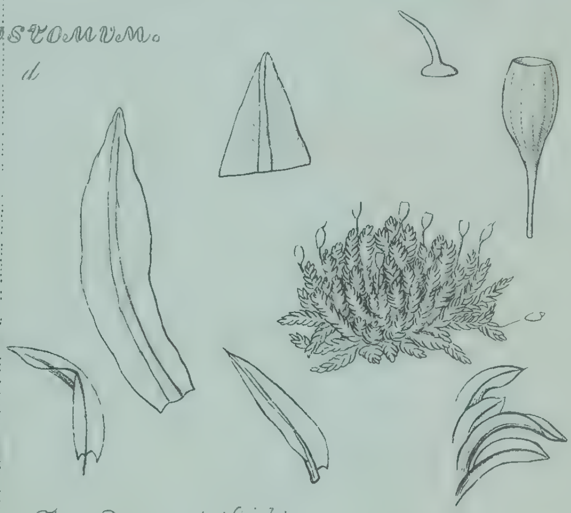
Hedwigia ciliata



Hedwigidium imberbe

GYMNOSTOMUM.



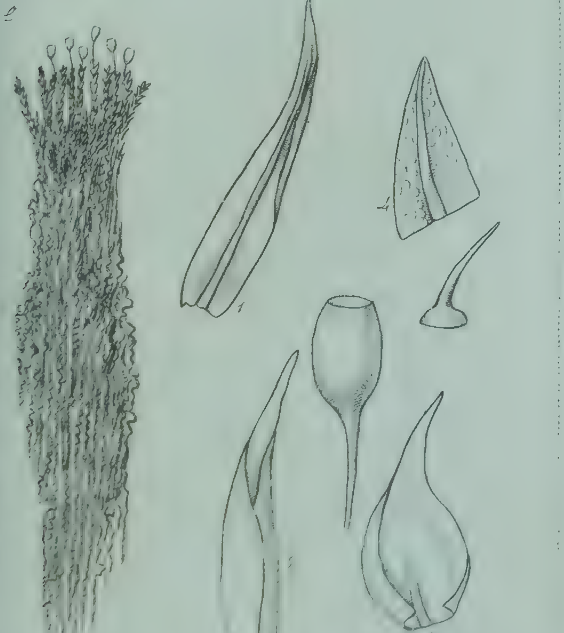


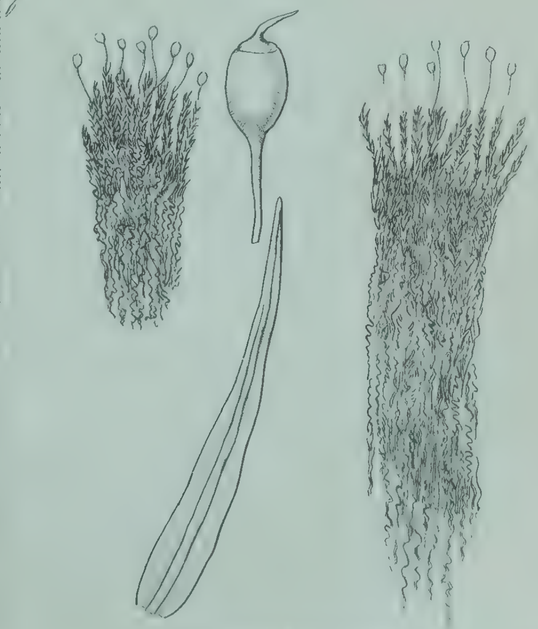
Zygodon lapponicus.

Zygodon viridissimus

Wm. Hooker Esq. delt.

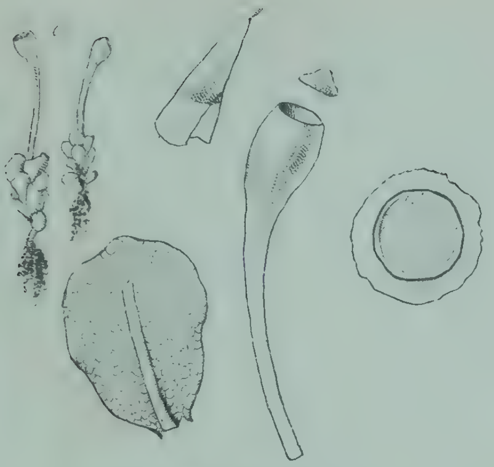
Edwards Sc.



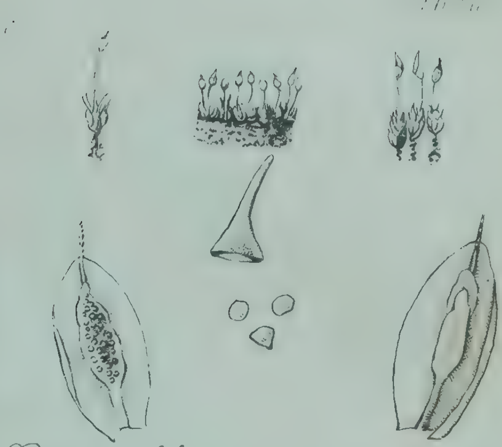


Anictangium compactum

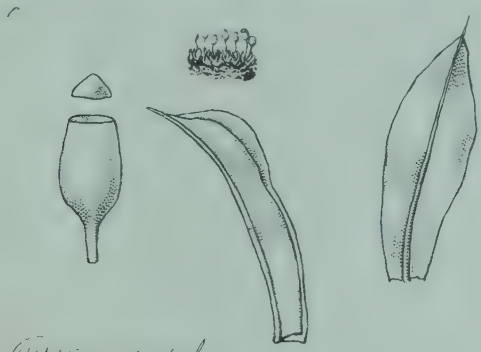
G. curvirostrum



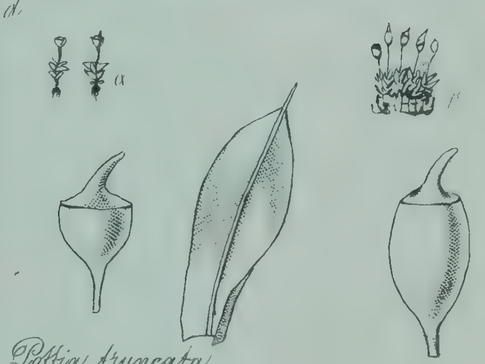
Oedipodium Griffithianum



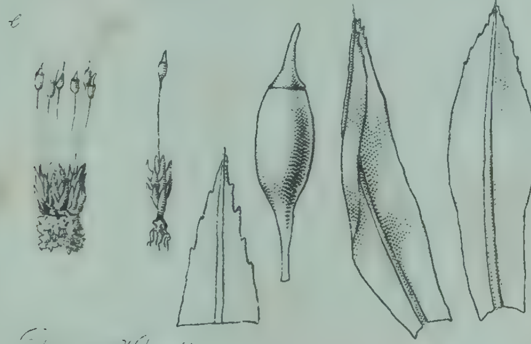
Pottia cavifolia



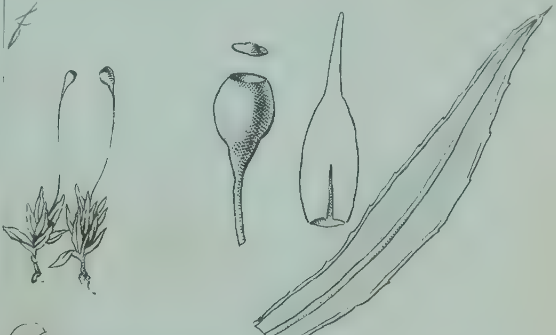
Pottia minutula: v.



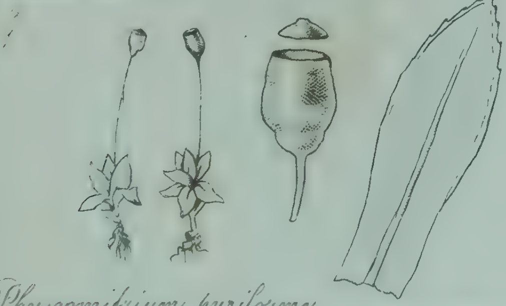
Pottia truncata



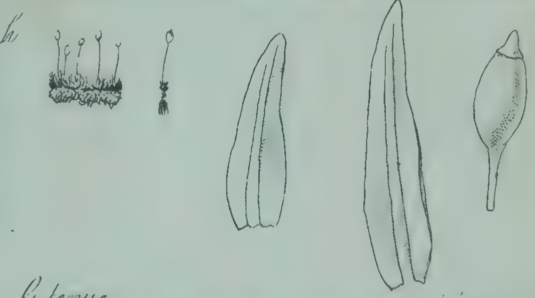
Pottia Heimii



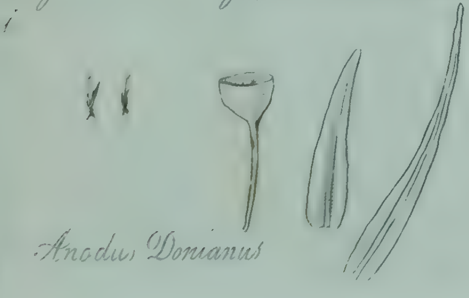
Physcomitrium ericetorum



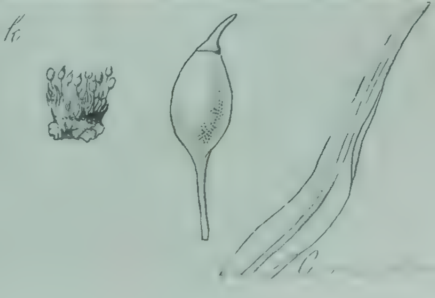
Physcomitrium pyriforme



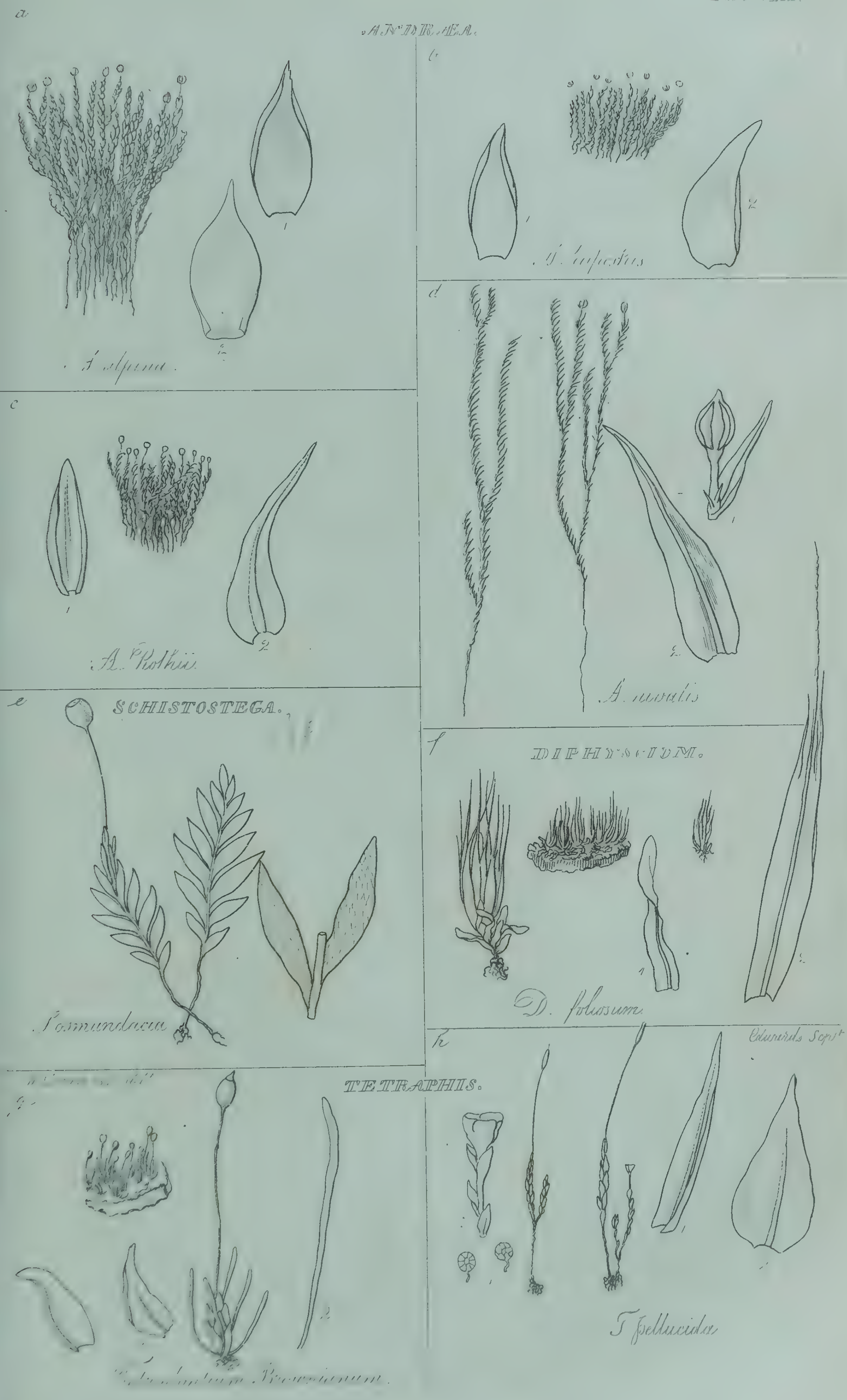
G. tenue



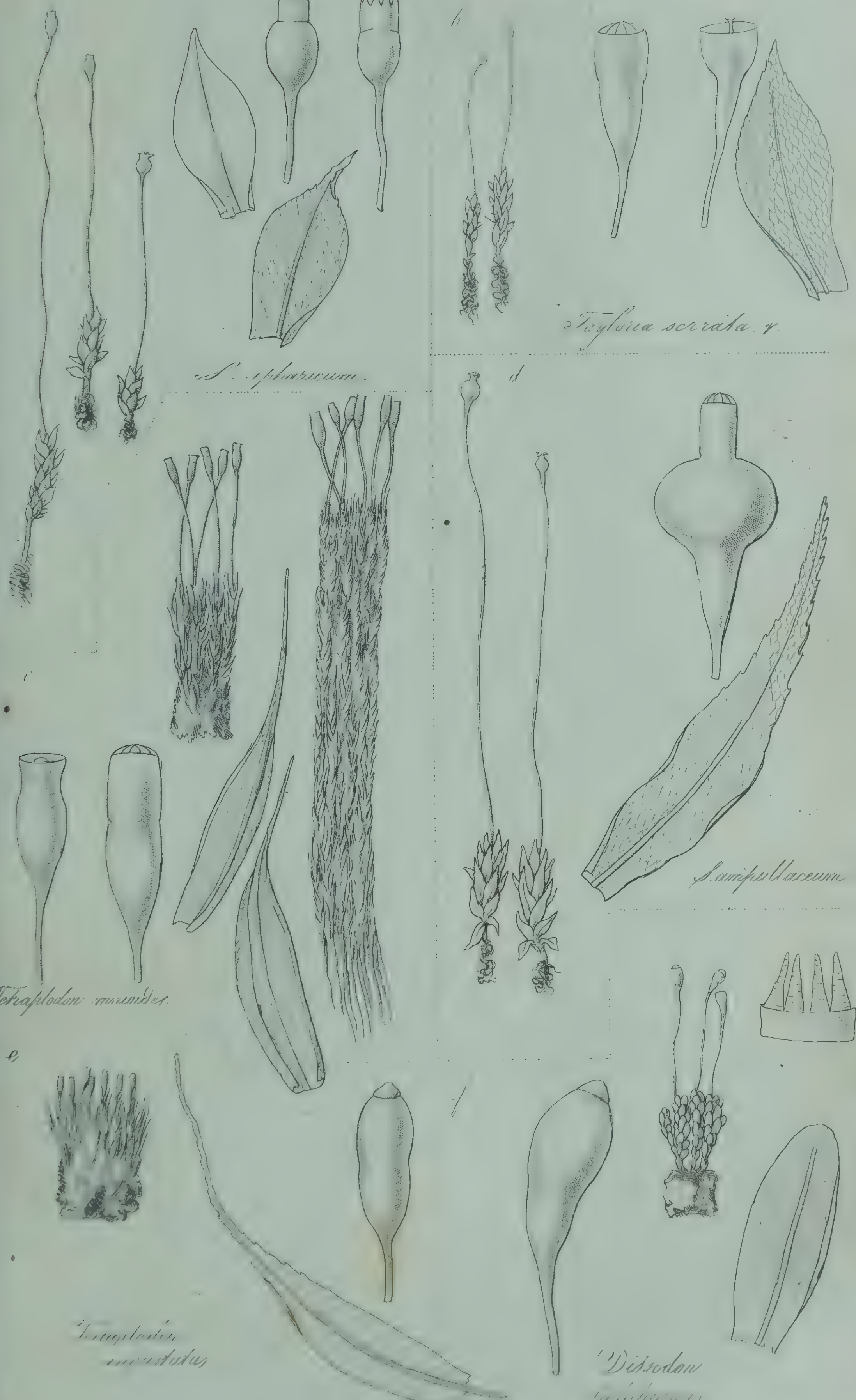
Anodus Donianus

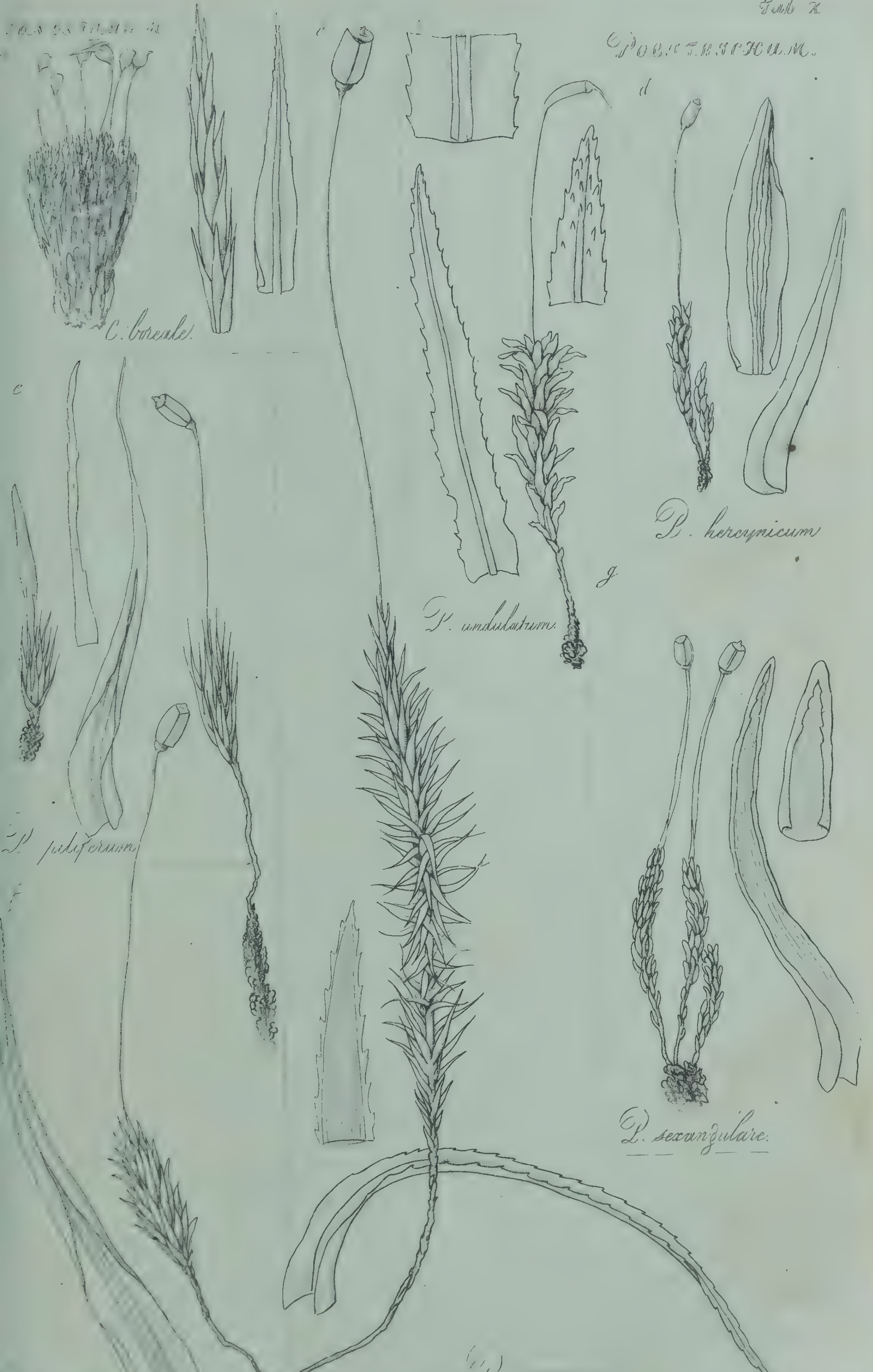


Tab. VIII.


a
ANDREÆA.
1
2
A. alpina.
b
1
2
A. rupestris
c
1
2
A. Rothii
d
1
2
A. nivalis
e
SCHISTOSTEGA.
S. osmundacea
f
DIPHYSCIUM.
1
2
D. foliosum
h
Edwards Sculpt
TETRAPHIS.
g
2
Tetrodontium Brownianum.
1
1
2
T. pellucida

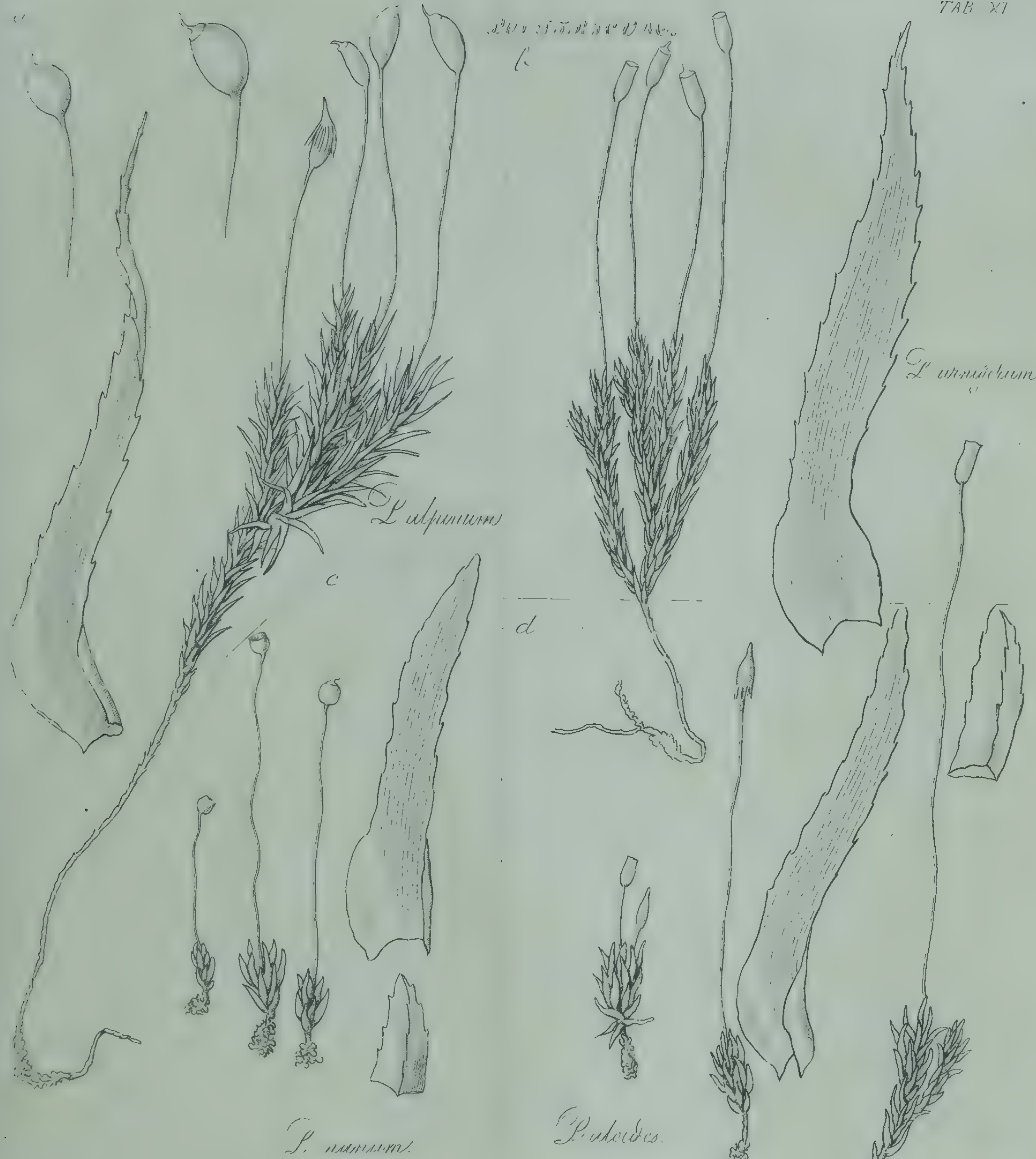
SPLACHNACEAE. Tab IX




CONOSTOMUM.
POLYTRICHUM.
C. boreale.
c
P. piliferum.
c
P. undulatum.
g
d
P. hercynicum
P. sexangulare.
P. commune.

TAB XI

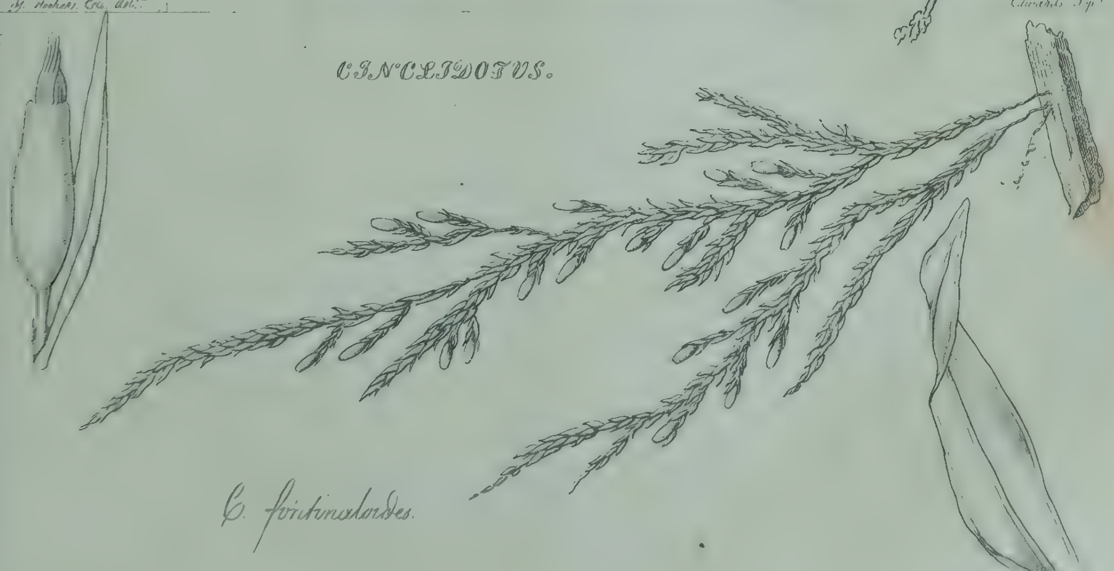
POGONATUM.

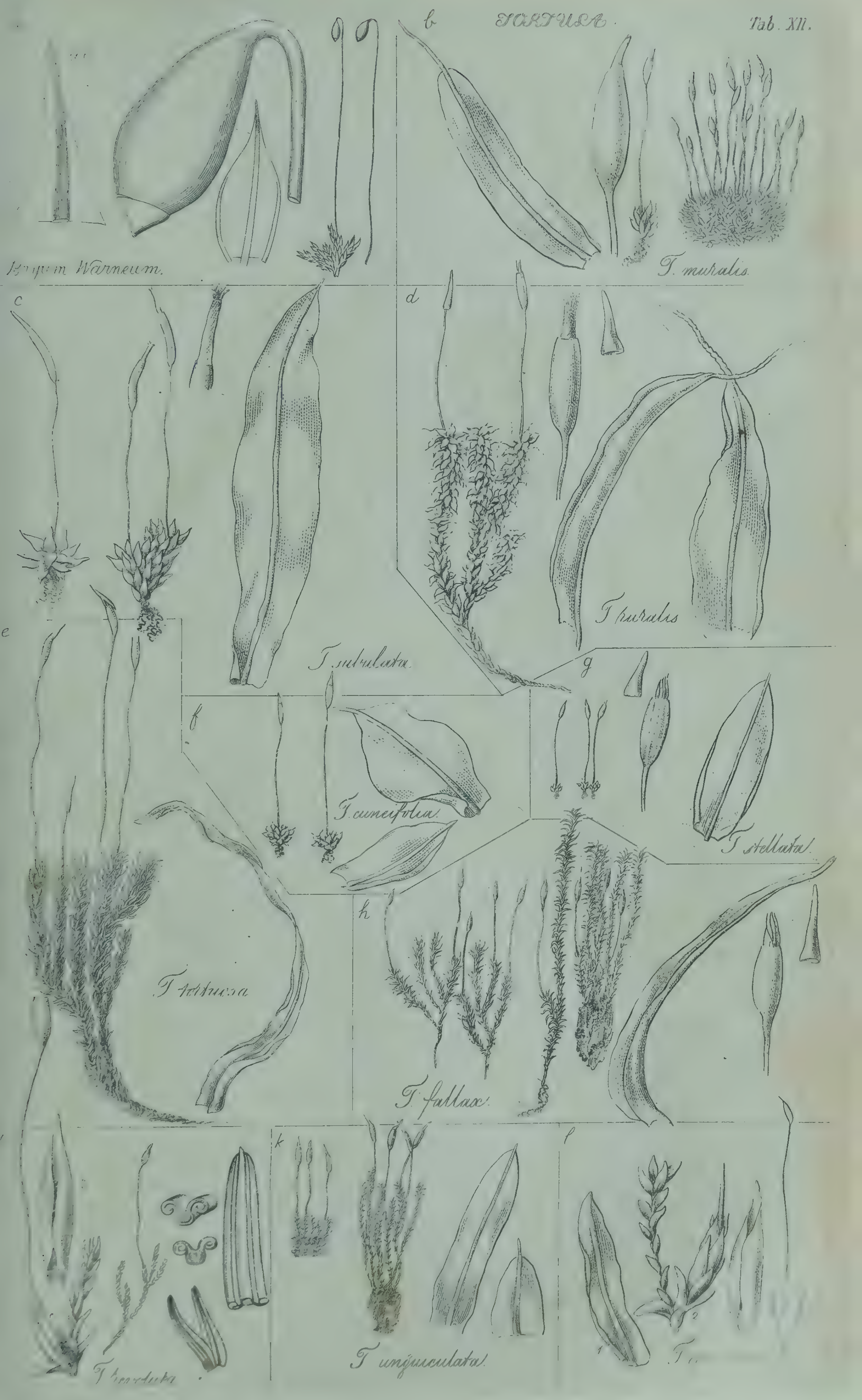


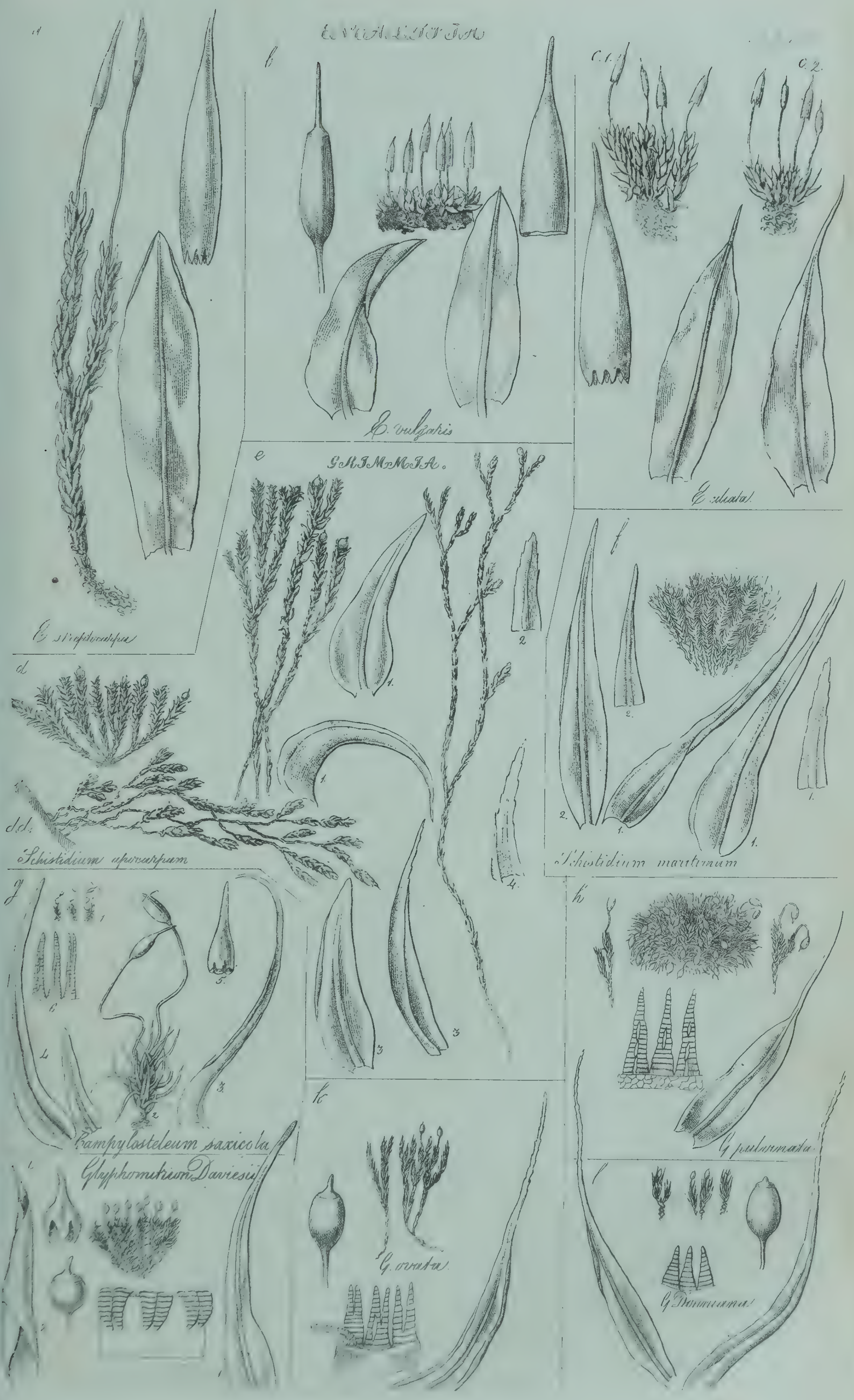
W. Hooker Esq. del.t

Edwards Sc.

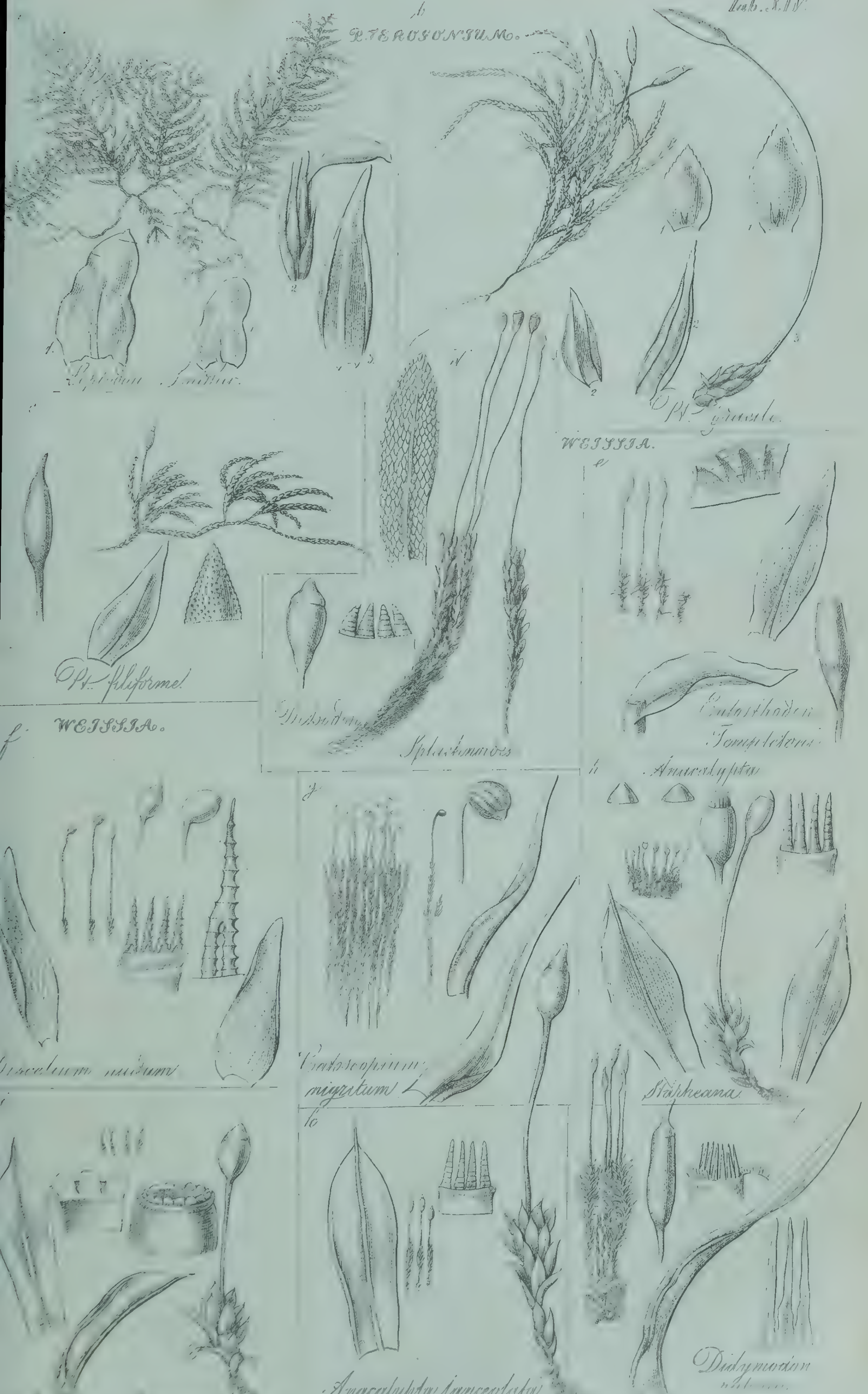
CINCLIDOTUS.


C. fontinaloides.

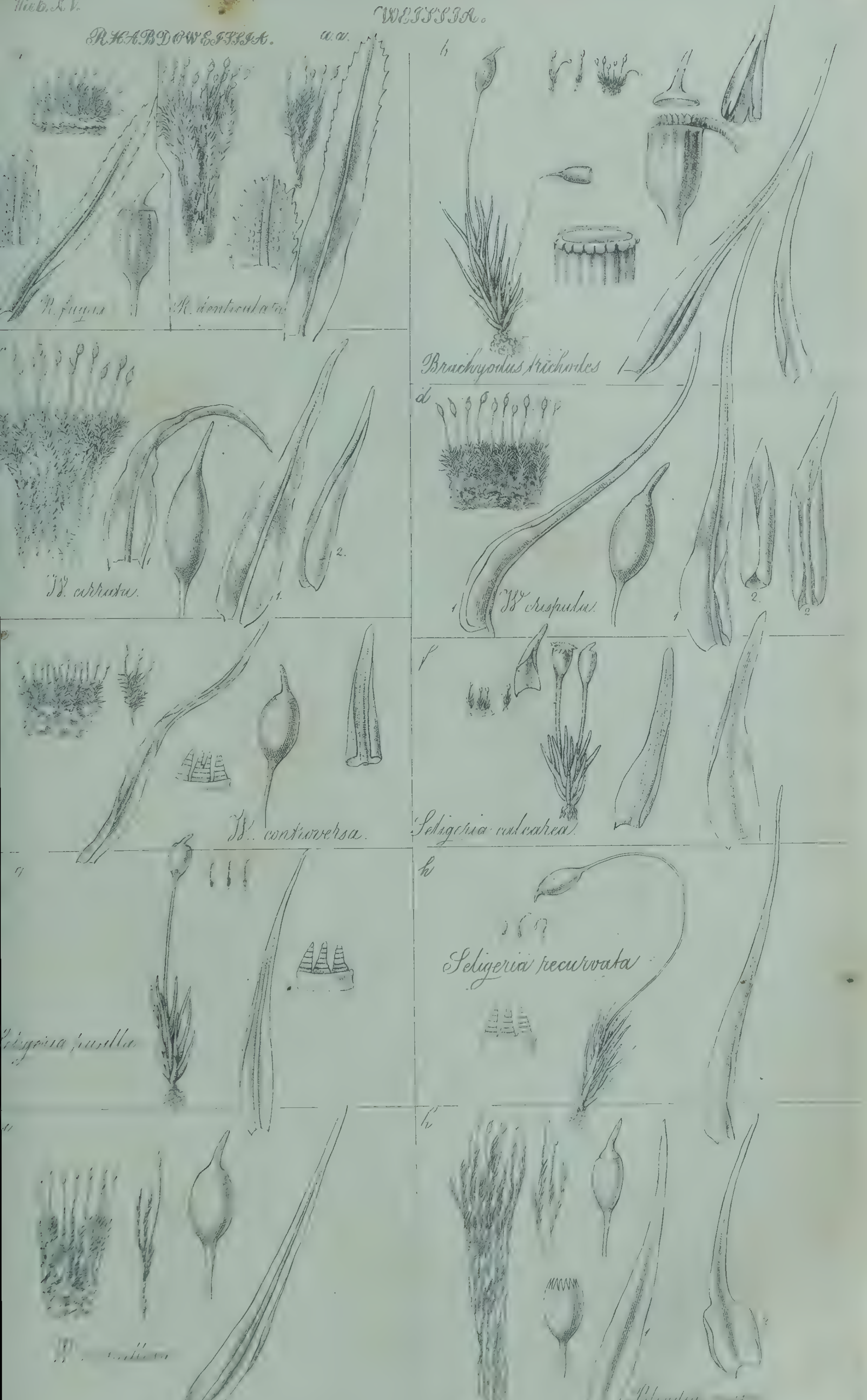

b
TORTULA
Tab. XII.
Bryum Warneum.
T. muralis.
c
d
T. ruralis
e
T. subulata.
f
g
T. cuneifolia.
T. stellata.
T. tortuosa
h
T. fallax.
k
l
T. revoluta
T. unguiculata.
T.


a
ENCALYPTA
b
c.1.
c.2.
E. vulgaris
E. ciliata
E. streptocarpa
e
GRIMMIA.
1.
2
3
4.
d
d.d.
Schistidium apocarpum
f
1.
2.
Schistidium maritimum
g
1
2
3.
4
5.
6
Campylosteleum saxicola
h
G. pulvinata
i
Glyphomitrium Daviesii
k
G. ovata
l
G. Donniana

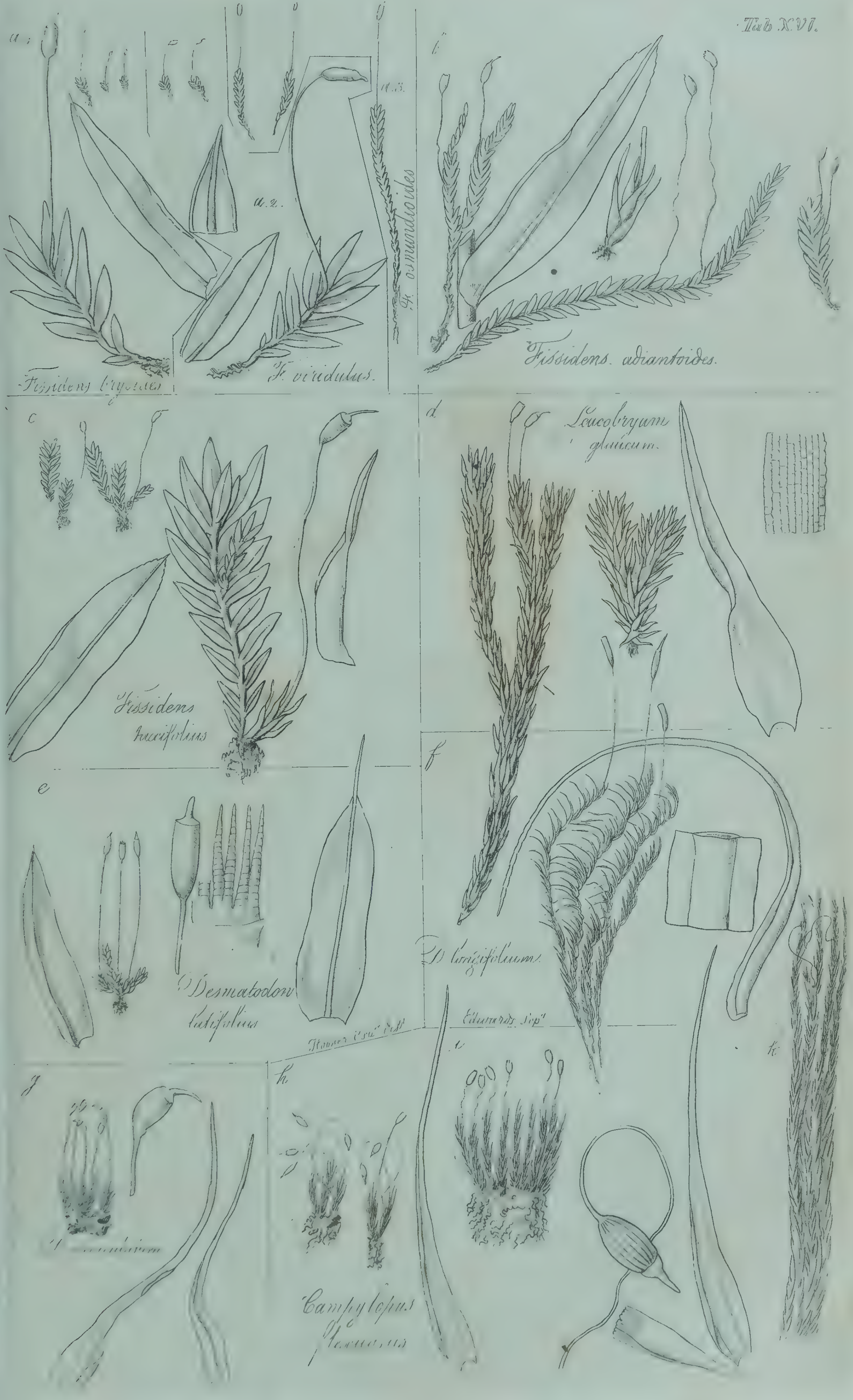
Tab. XIV.


b
PTEROGONIUM.
Leptodon Smithii
Pt. gracile
c
Pt. filiforme
d
Dissodon Splachnoides
WEISSIA.
e
Entosthodon Templetoni
WEISSIA.
f
iscelium nudum
g
Catoscopium nigritum
h
Anacalypta
Starkeana
Anacalypta lanceolata
nacalypta Rostrana var
Didymodon

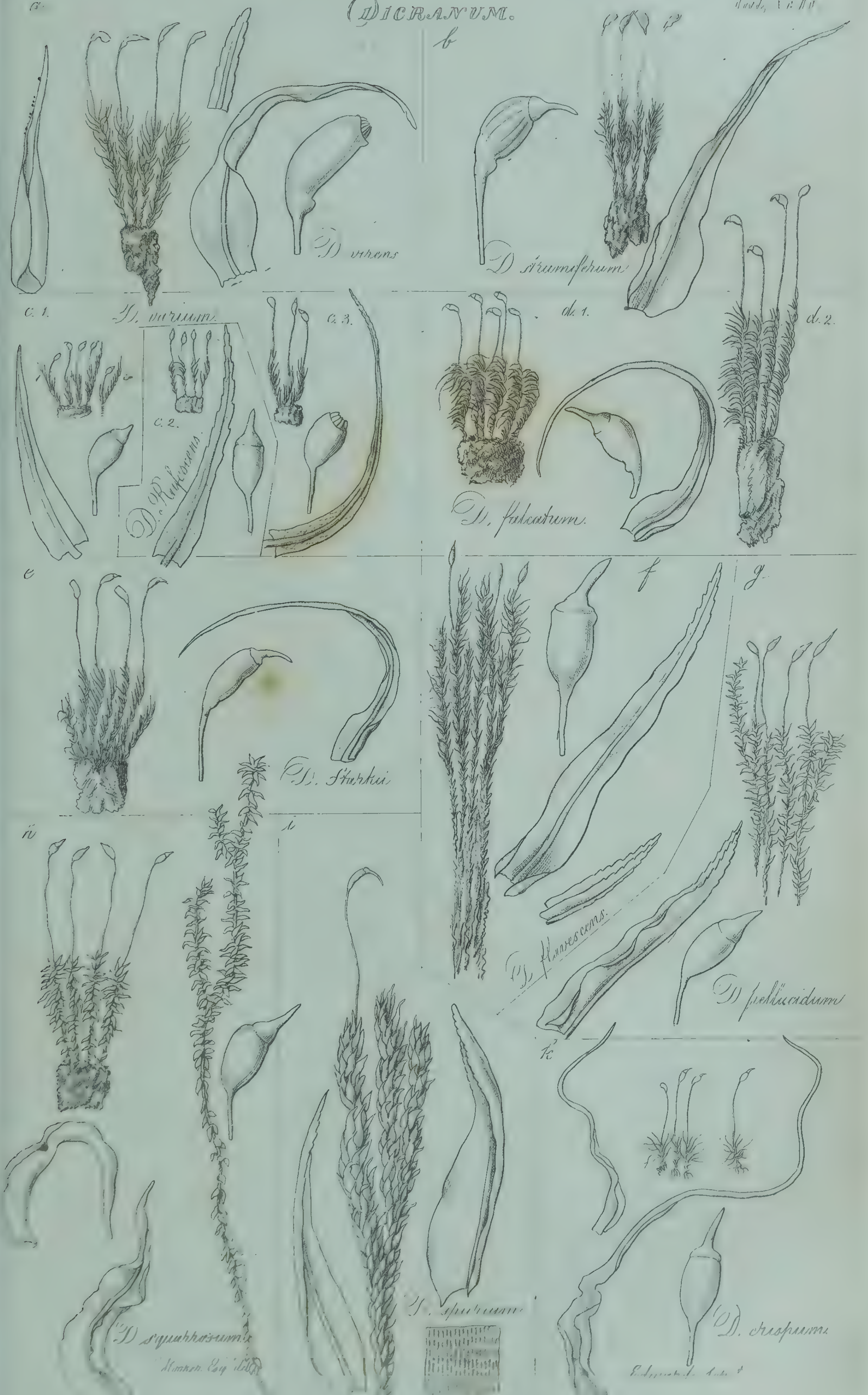
Tab. XV.


RHABDOWEISIA.
WEISSIA.
a. a.
R. fugax
R. denticulata
b
Brachyodus trichodes
1
W. cirrata
1
2.
d
W. crispula
1
2.
2
W. controversa
f
Seligeria calcarea
g
Seligeria pusilla
h
Seligeria recurvata
h

Tab. XVI.


a.1
a.2
a.3
Fissidens bryoides
F. viridulus
F. osmundioides
b
Fissidens adiantoides
c
Fissidens taxifolius
d
Leucobryum glaucum
e
Desmatodon latifolius
f
D. longifolium
Hosner del.
Edwards sc.
g
h
i
k
Campylopus flexuosus

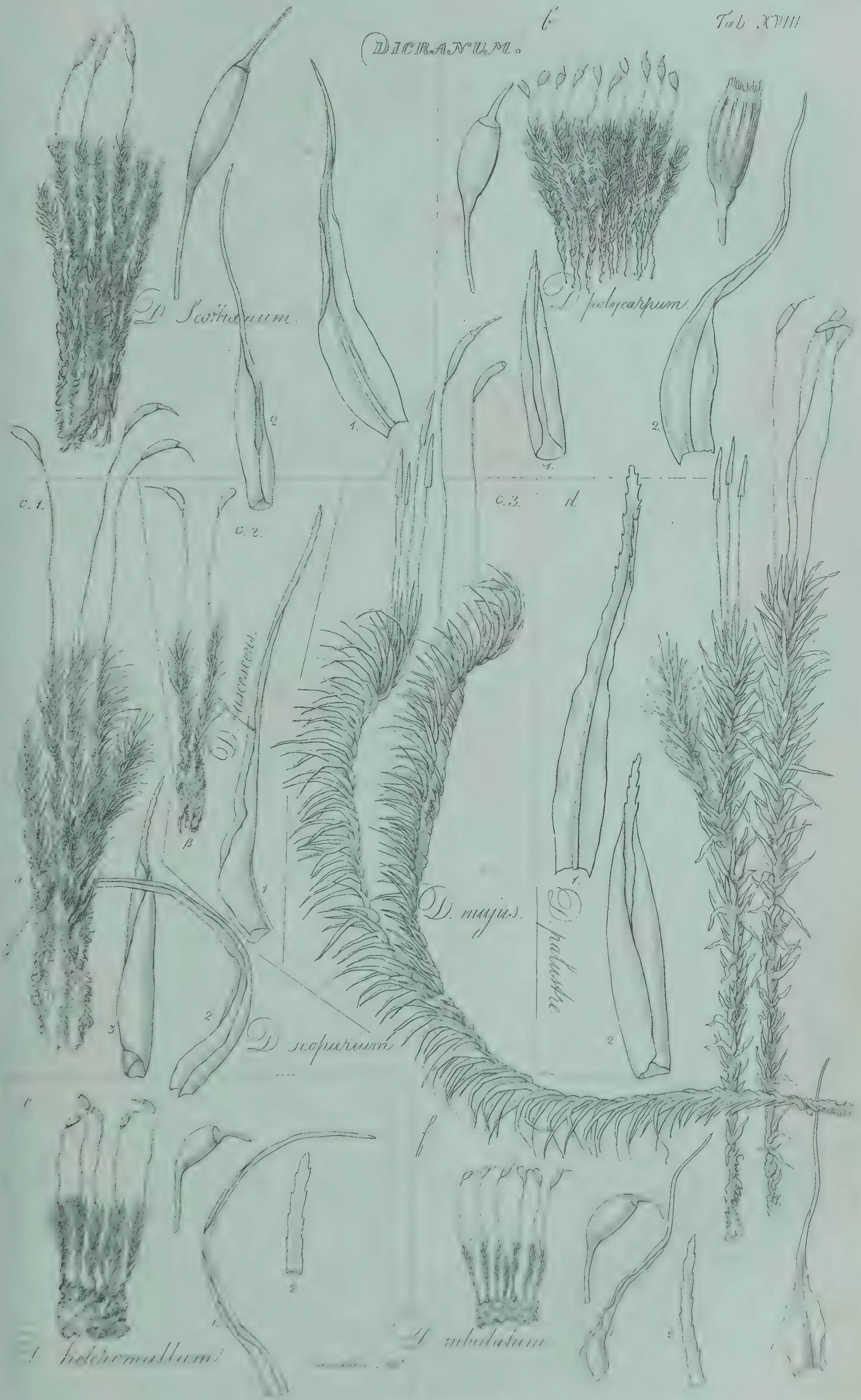
DICRANUM.


a
b
D. virens
D. strumiferum
D. varium
c. 1
c. 2
c. 3
D. Rufescens
d. 1
d. 2
D. falcatum
e
D. Starkii
f
g
D. flavescens
D. pellucidum
h
i
k
D. squarrosum
D. spurium
D. crispum
Hooker. Esq. del.

Tab. XVIII

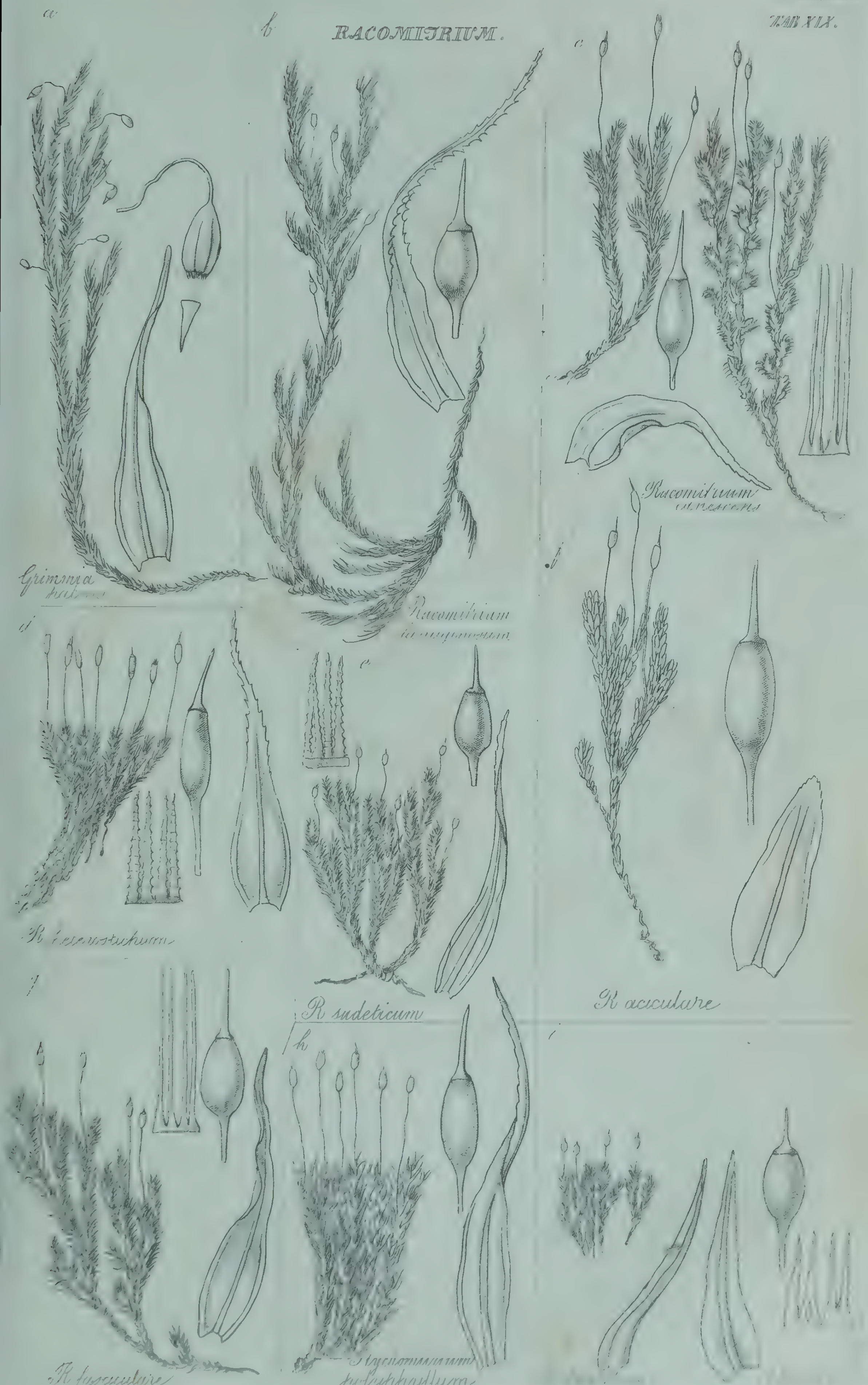
6

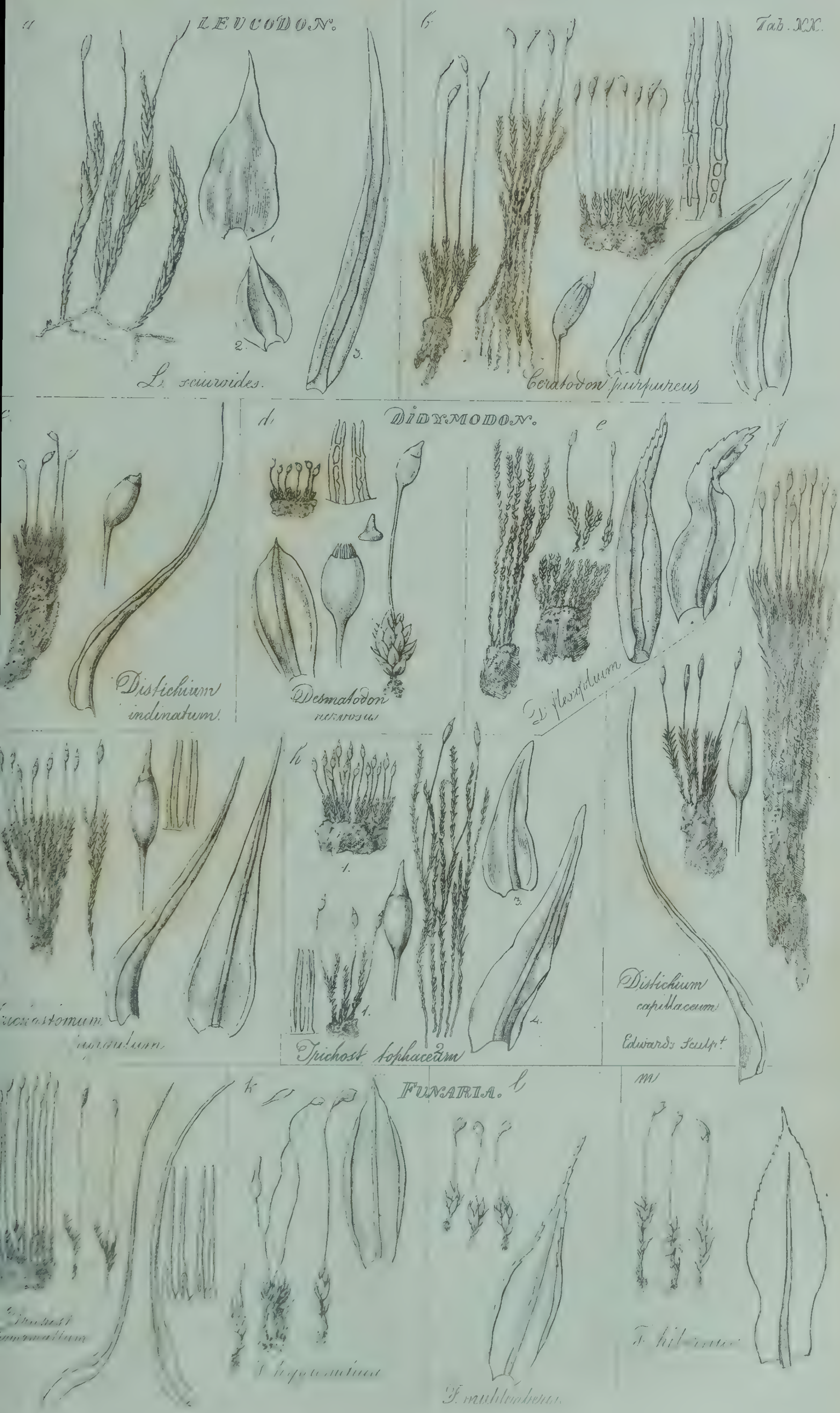
DICRANUM.

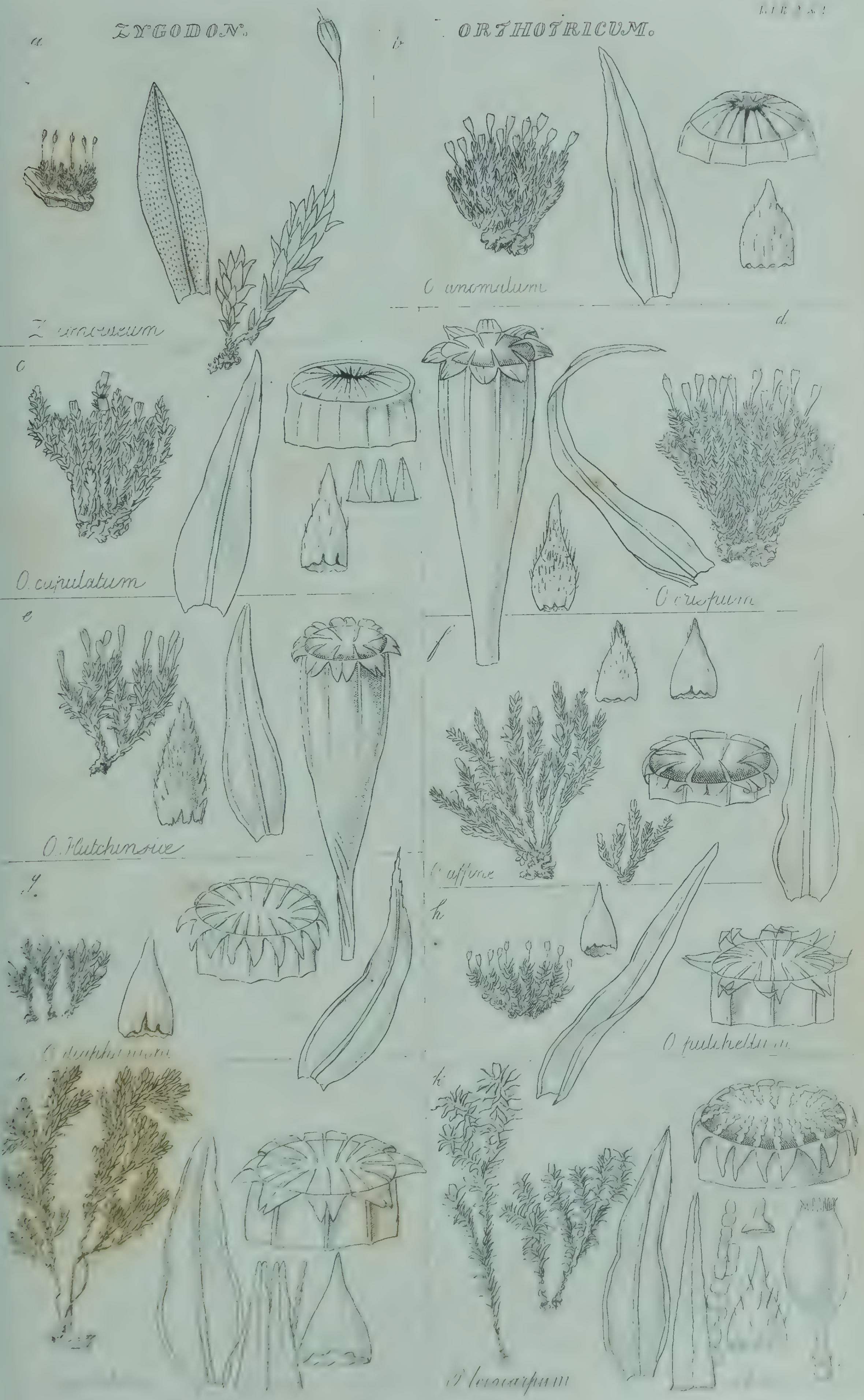


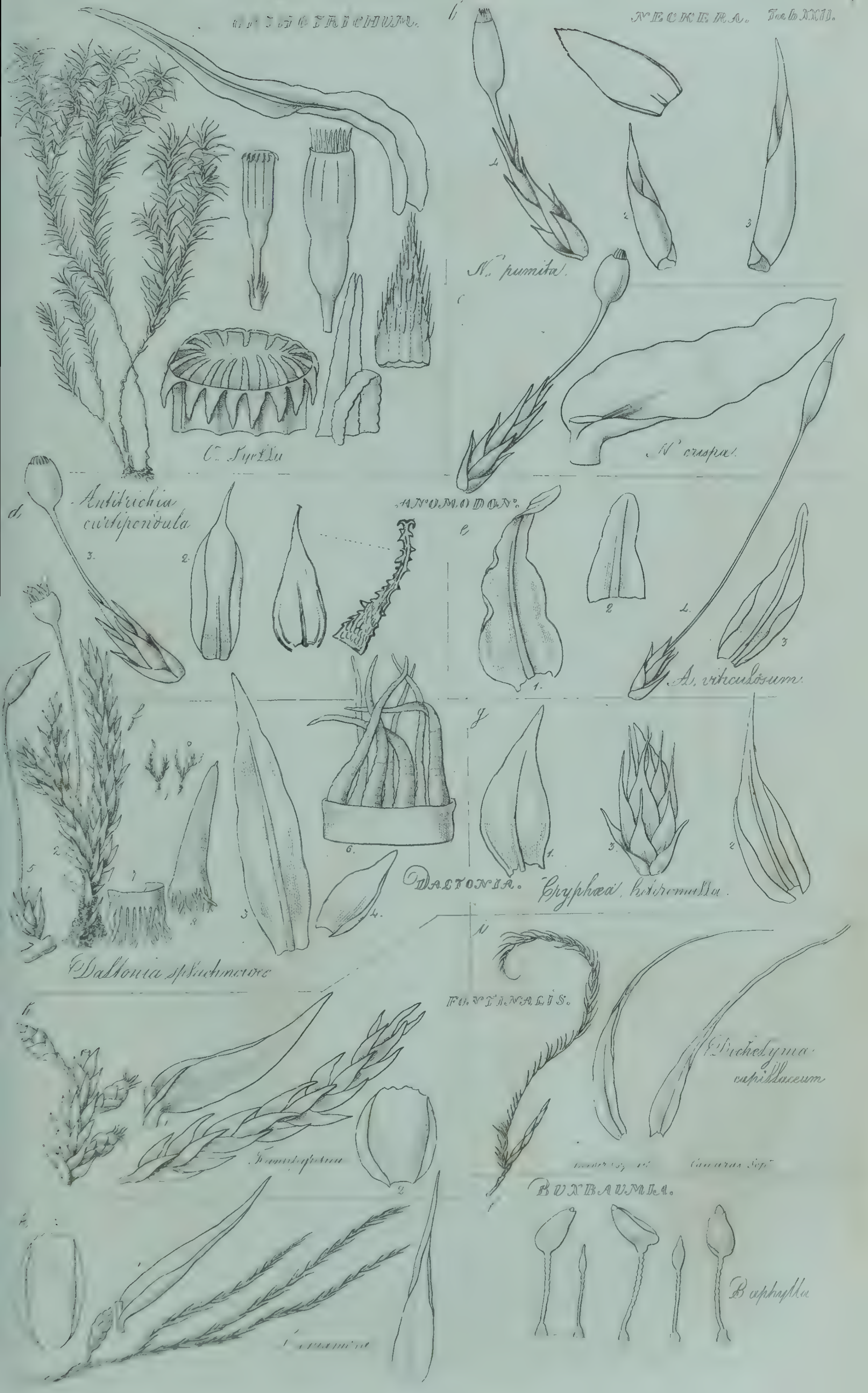
TAB XIX.

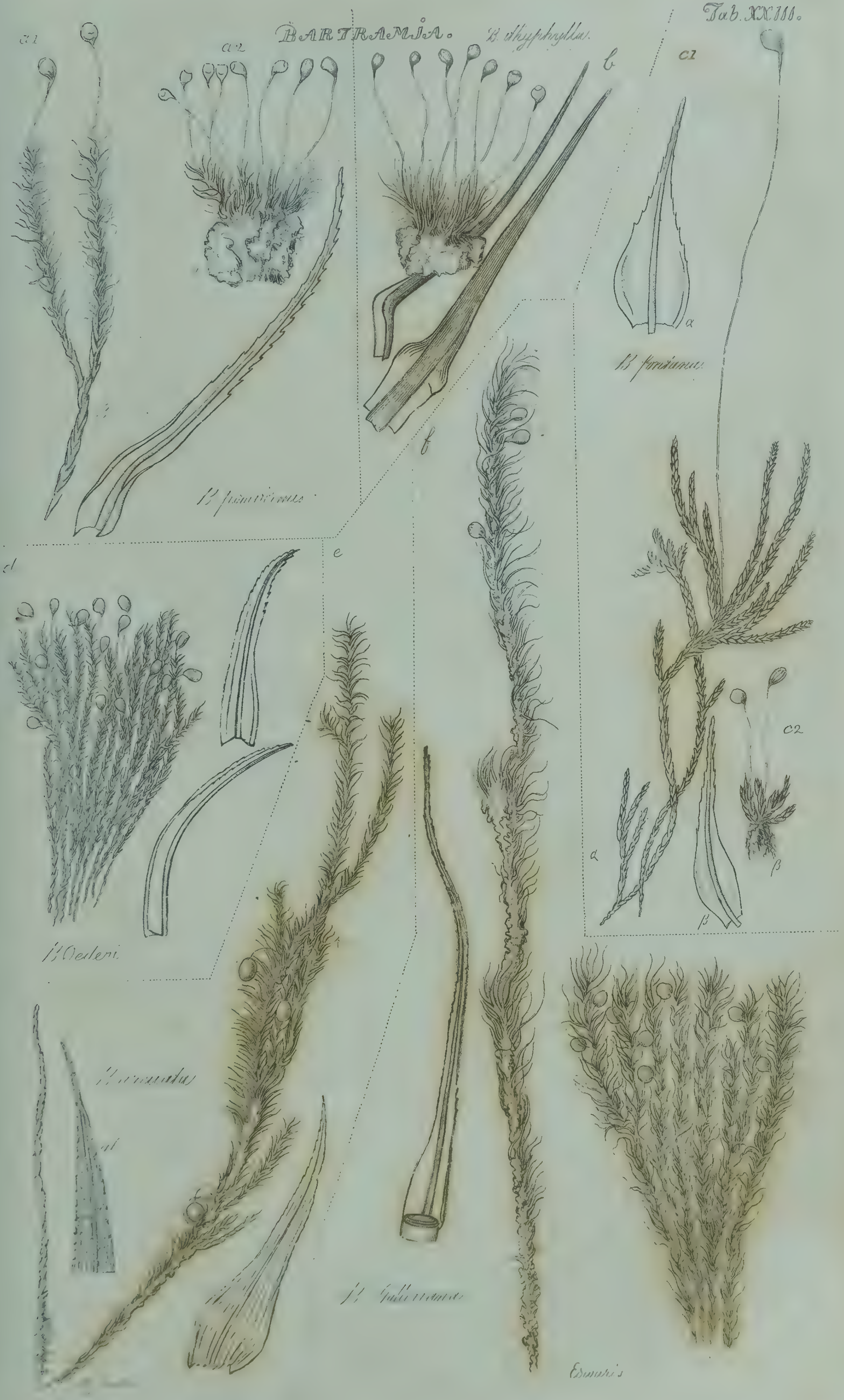
RACOMITRIUM.

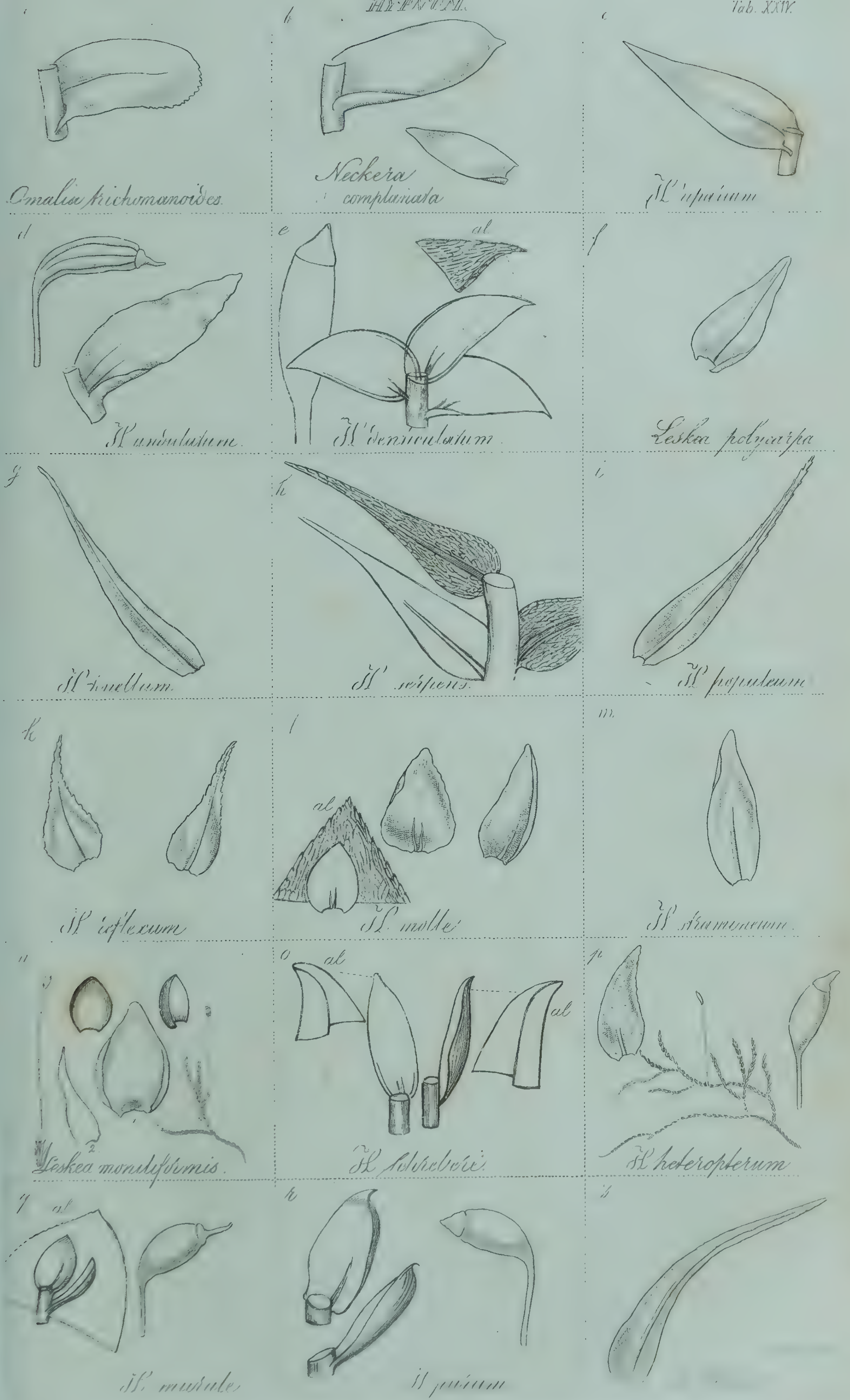


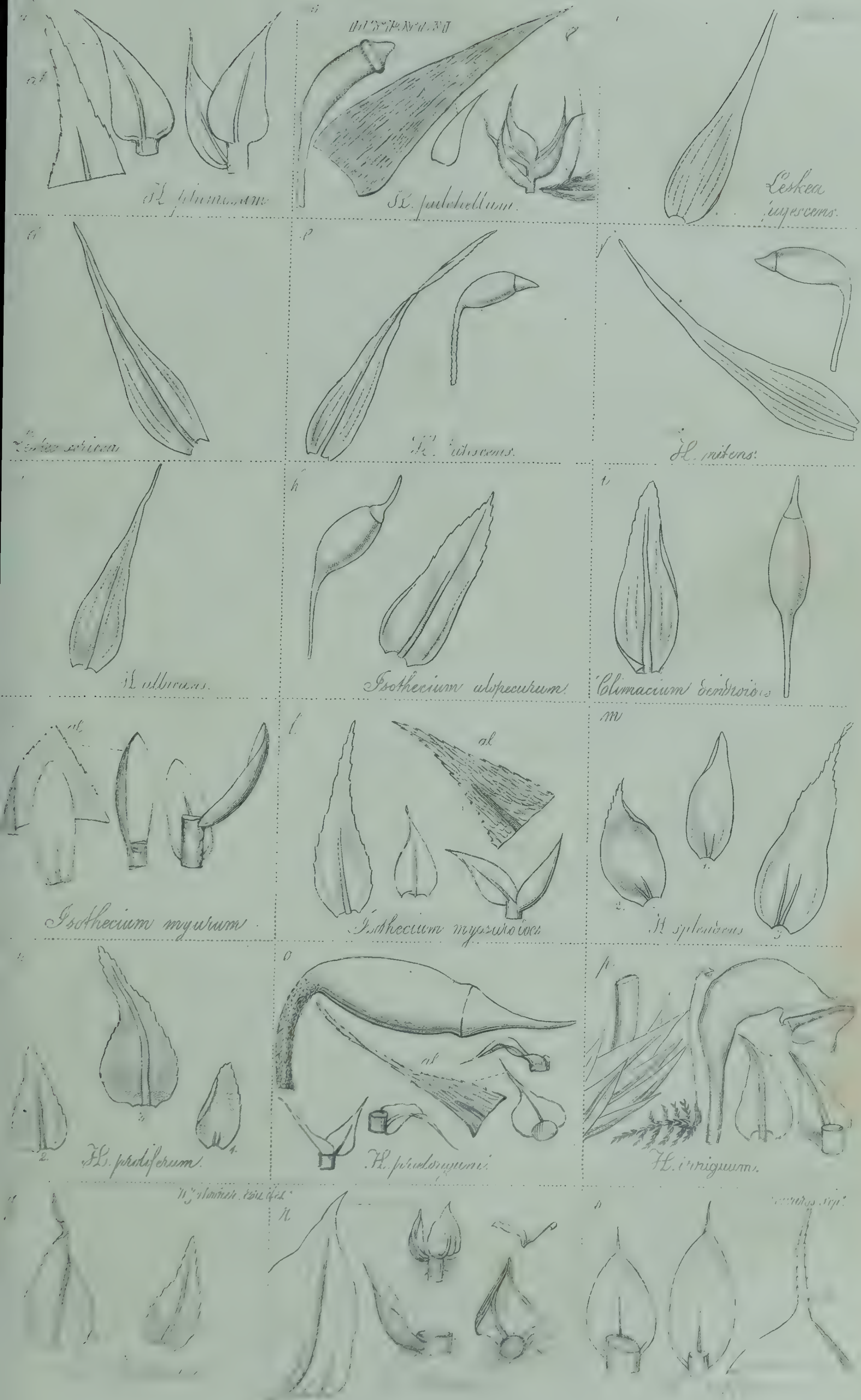

a
LEUCODON.
b
Tab. XX.
1.
2.
3.
L. sciuroides.
Ceratodon purpureus
c
d
DIDYMODON.
e
f
Distichium inclinatum.
Desmatodon nervosus
D. flexifolium
h
1.
3.
1.
4.
Trichost. tophaceum
Distichium capillaceum
Edwards Sculp.t
k
FUNARIA.
l
m
F. hibernica
F. muhlenbergii

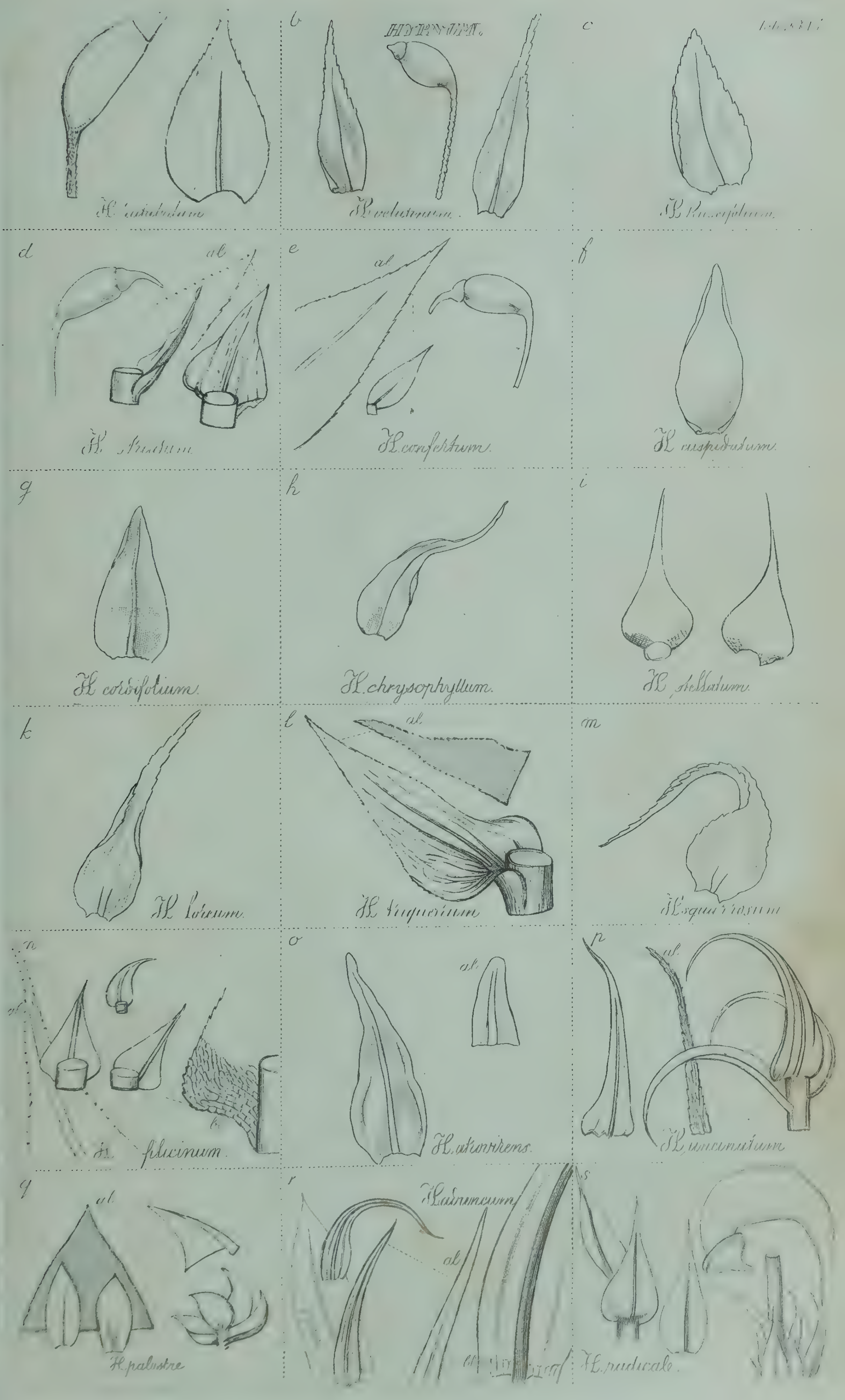

ZYGODON.
ORTHOTRICUM.
a
b
O. anomalum
Z. [illegible]
c
d
O. cupulatum
O. crispum
e
f
O. Hutchinsiæ
O. affine
g
h
O. diaphanum
O. pulchellum
i
k
O. leiocarpum


ORTHOTRICHUM.
b
NECKERA.
Tab. XXII.
1
2
3
N. pumila.
c
O. Lyellii
N. crispa.
Antitrichia curtipendula
d
3.
2.
ANOMODON.
e
2
1.
1.
3
A. viticulosum.
f
2.
5
7
8
3
6.
4.
g
1.
3.
2
DALTONIA.
Cryphaea heteromalla.
Daltonia splachnoides
h
i
FONTINALIS.
Dichelyma capillaceum
F. antipyretica
2
BUXBAUMIA.
k
F. squamosa
B. aphylla

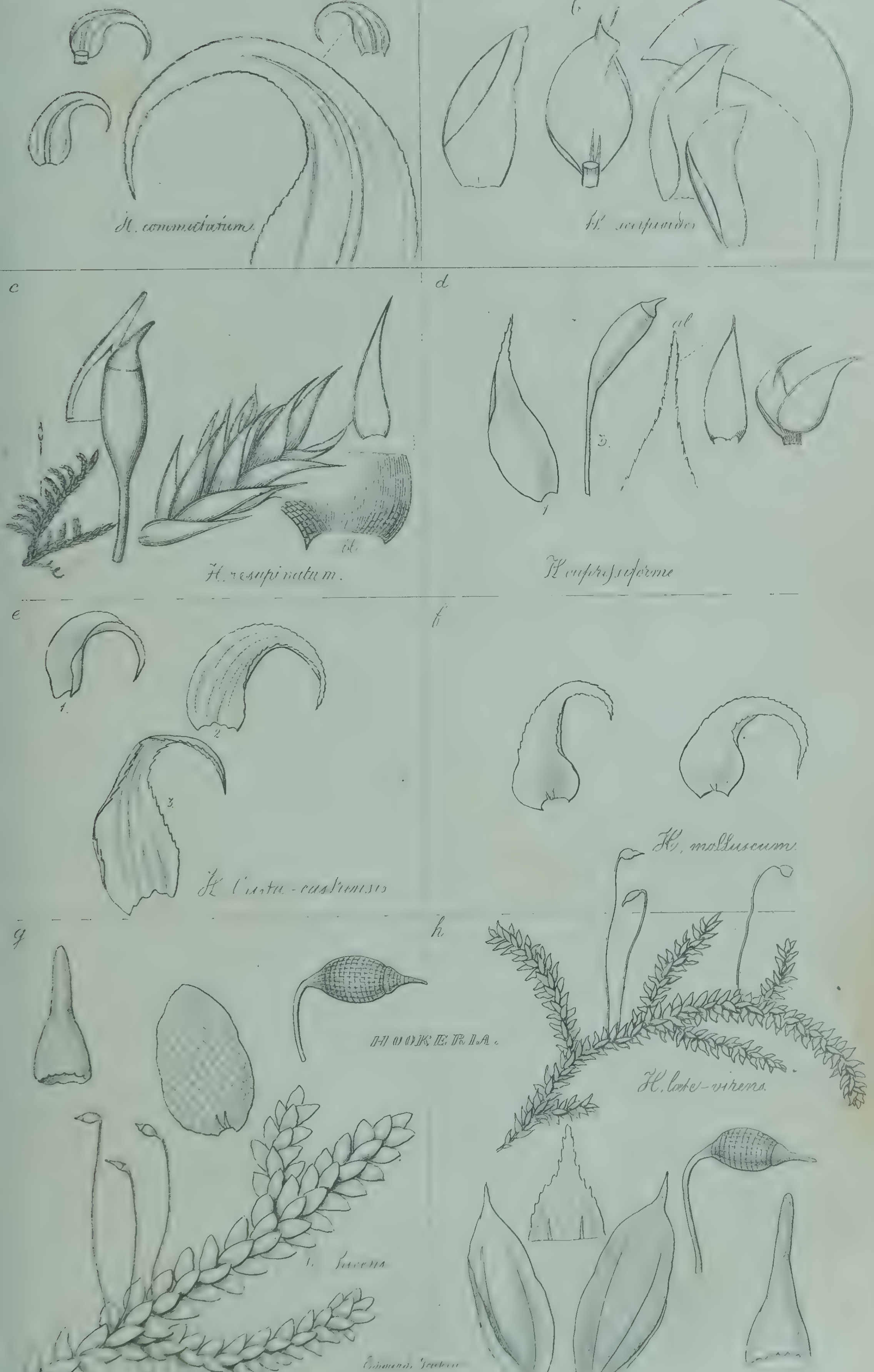

Tab. XXIII.
BARTRAMIA.
B. ithyphylla
a1
a2
b
c1
α
B. fontana
B. pomiformis
f
d
e
c2
α
β
β
B. Oederi
B. arcuata
d
B. Halleriana
Edwards

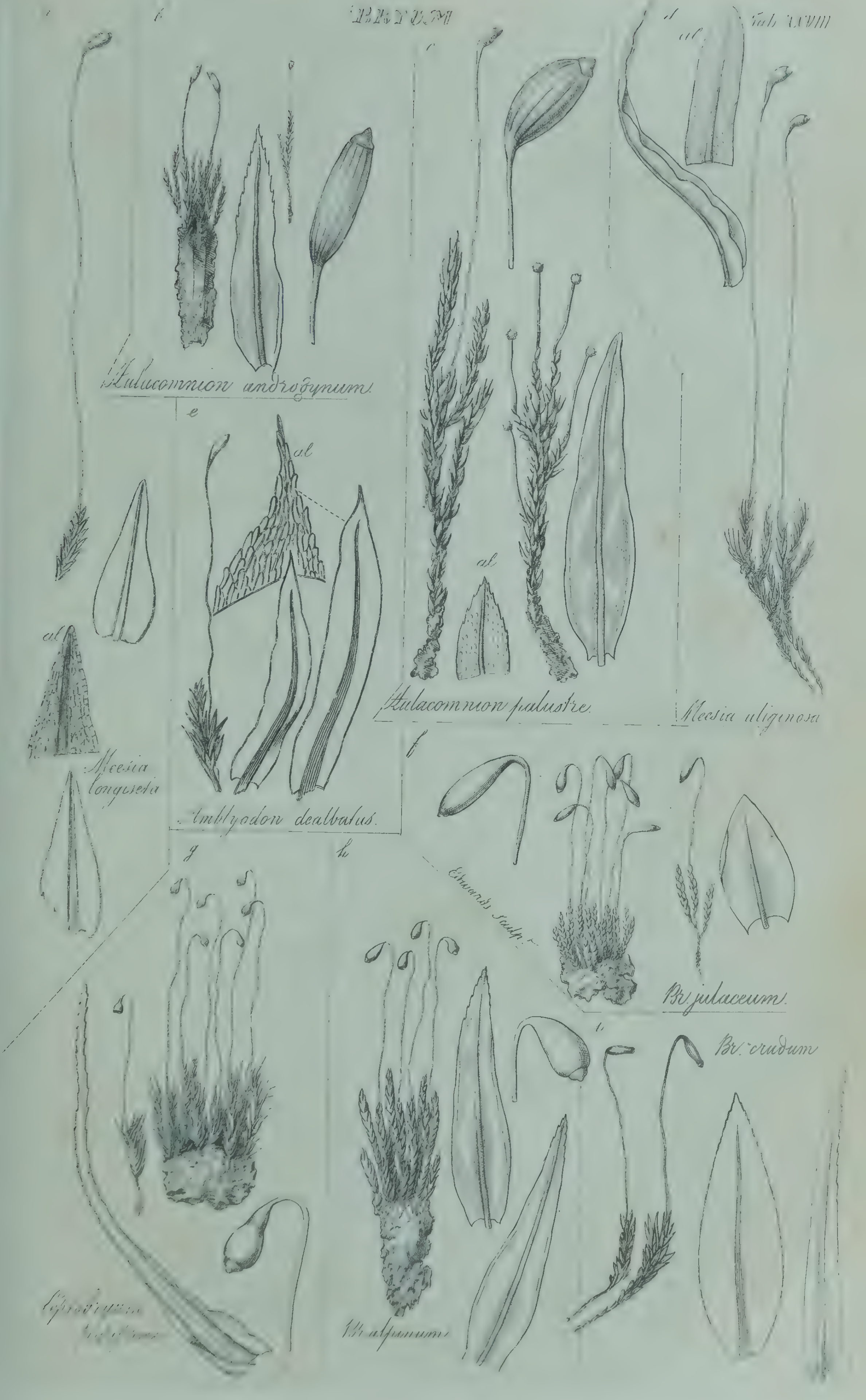

a
Omalia trichomanoides.
b
Neckera complanata
c
H. riparium
d
H. undulatum.
e
al
H. denticulatum.
f
Leskea polycarpa
g
H. tenellum.
h
H. serpens.
i
H. populeum
k
H. reflexum
l
al
H. molle
m
H. stramineum.
n
2
Leskea moniliformis.
o
al
al
H. Schreberi.
p
H. heteropterum
q
al
H. murale
r
H. purum
s


a
al
H. plumosum
b
H. pulchellum
c
Leskea
iugescens
d
Leskea sericea
e
H. lutescens
f
H. nitens
g
H. albicans
h
Isothecium alopecurum
i
Climacium dendroides
k
al
Isothecium myurum
l
al
Isothecium myosuroides
m
1.
2.
3.
H. splendens
n
2.
3.
4.
H. proliferum
o
al
H. praelongum
p
H. irriguum
q
r
s

HYPNUM.
Tab. XXI
a
H. rutabulum
b
H. velutinum
c
H. ruscifolium
d
al
H. striatum
e
al
H. confertum
f
H. cuspidatum
g
H. cordifolium
h
H. chrysophyllum
i
H. stellatum
k
H. loreum
l
al
H. triquetrum
m
H. squarrosum
n
al
b
H. filicinum
o
al
H. atrovirens
p
al
H. uncinatum
q
al
H. palustre
r
H. aduncum
al
s
H. radicale.

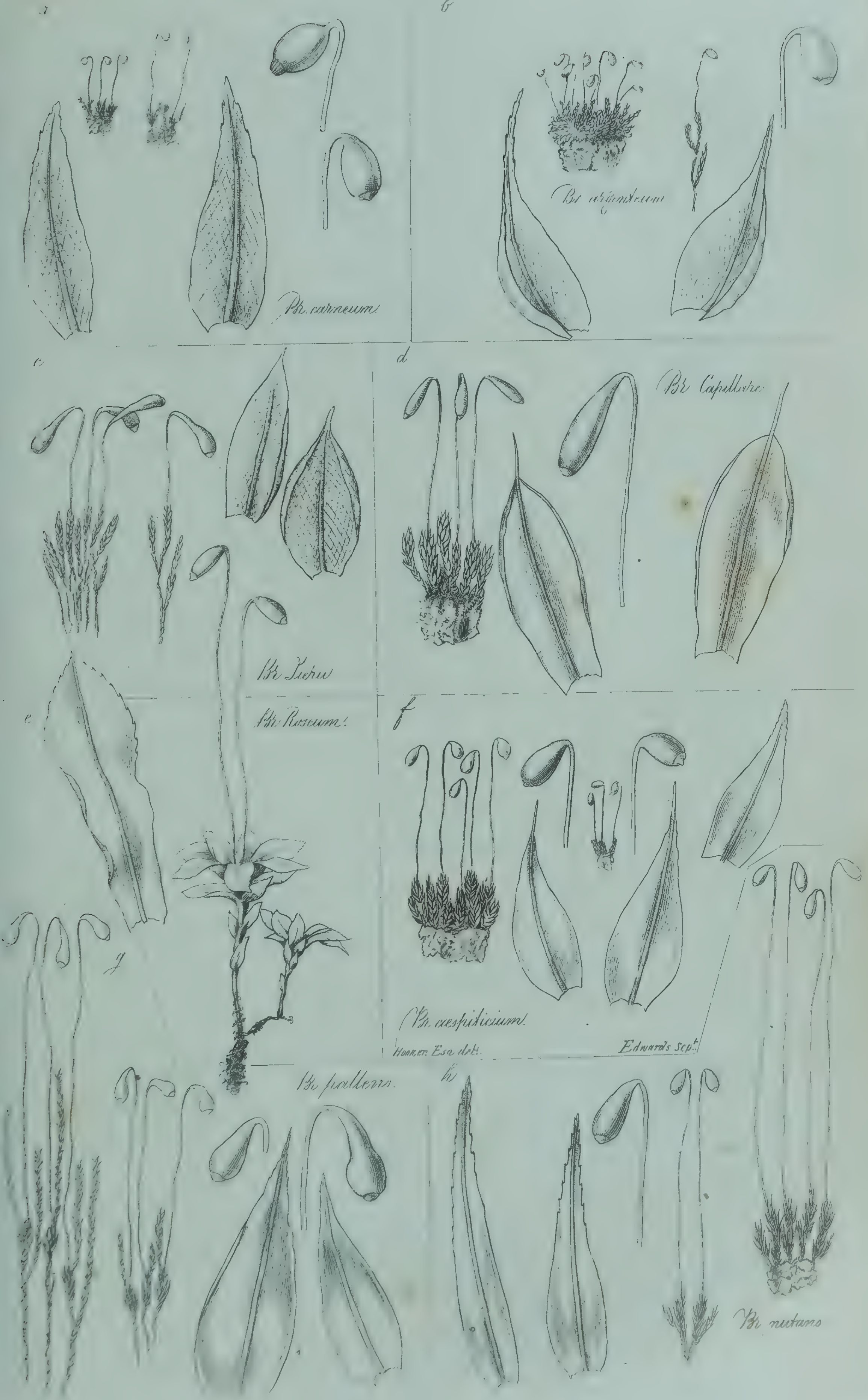
HYPNUM Tab. XXVII.




a
b
c
d
al
Aulacomnion androgynum
e
al
Amblyodon dealbatus
al
Meesia longiseta
al
Aulacomnion palustre
Meesia uliginosa
f
g
h
Edwards Sculp.
Br. julaceum
i
Br. crudum
Leptobryum pyriforme
Br. alpinum

BRYUM, b

Tab. XXIX

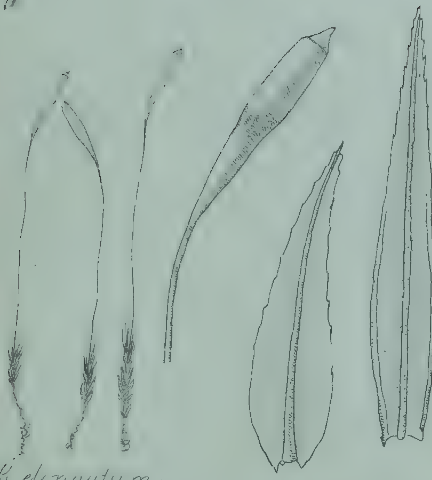


Hooker Esq. delt.

Edwards Sc.

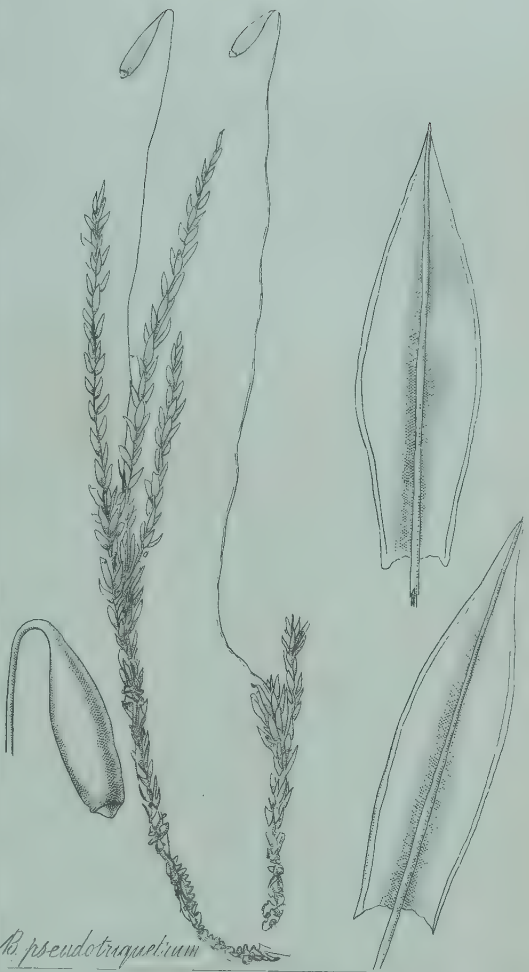
BRYUM. Tab XXX.

a



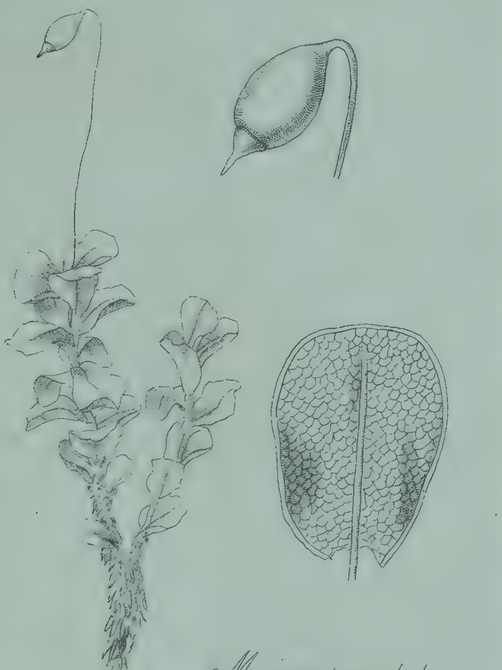
B. elongatum

b



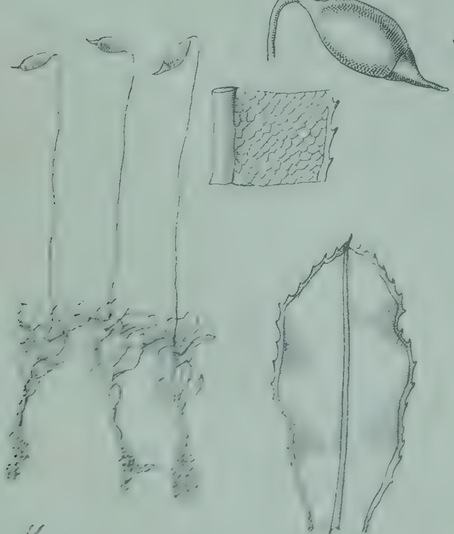
B. pseudotriquetrum

c



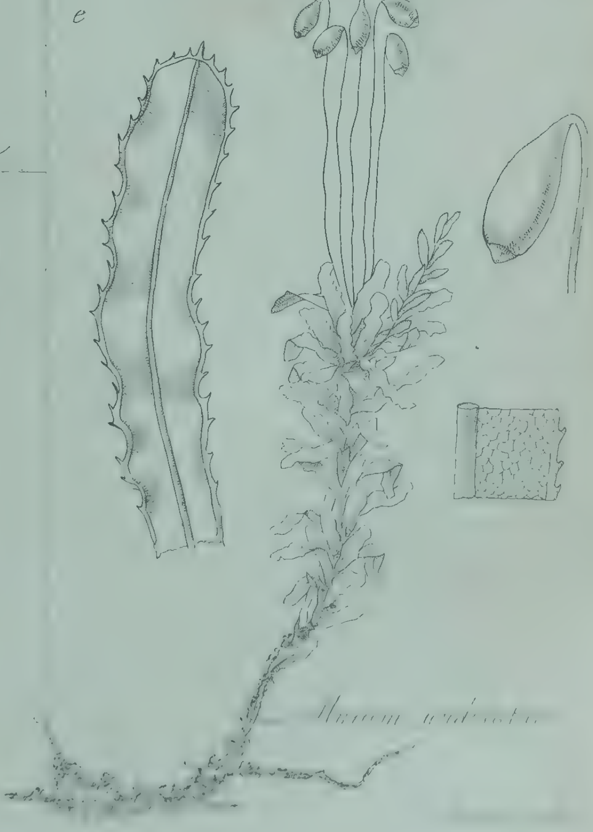
Mnium punctatum

d



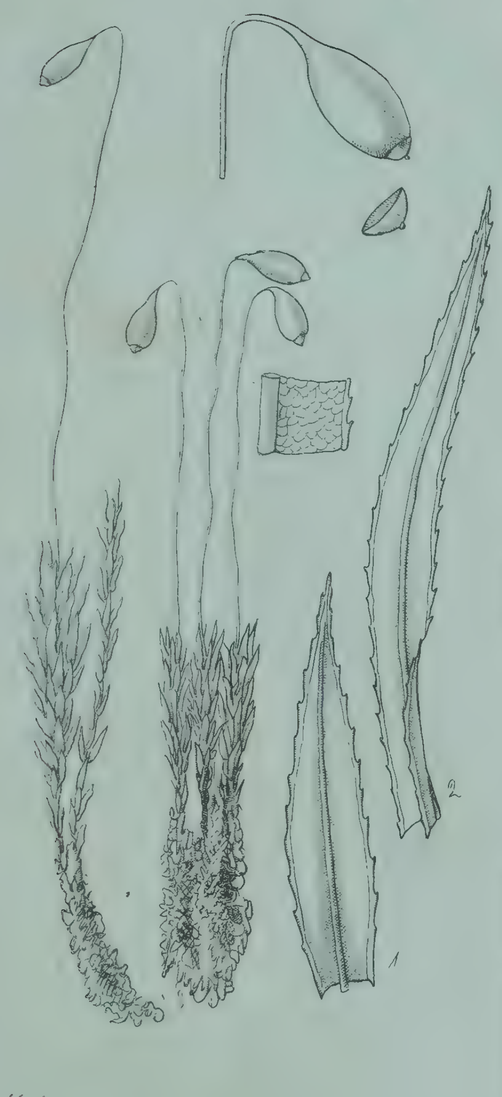
Mnium rostratum

e

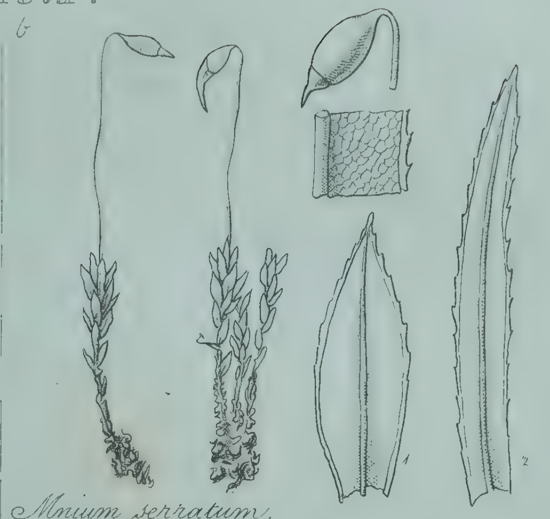


Mnium undulatum

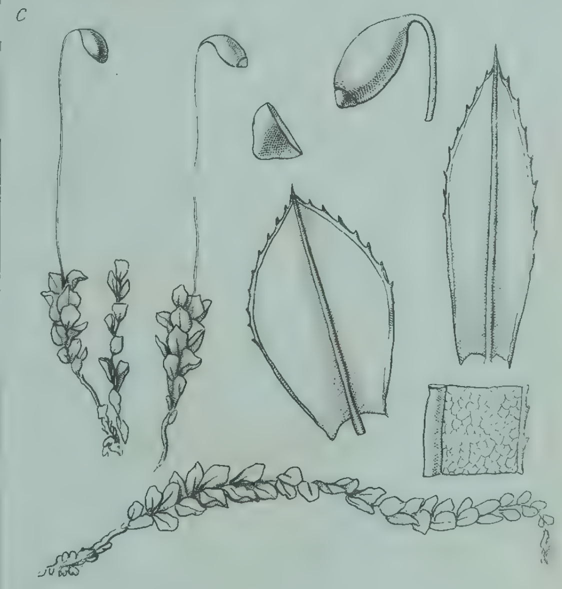
MNIUM.



M. hornum

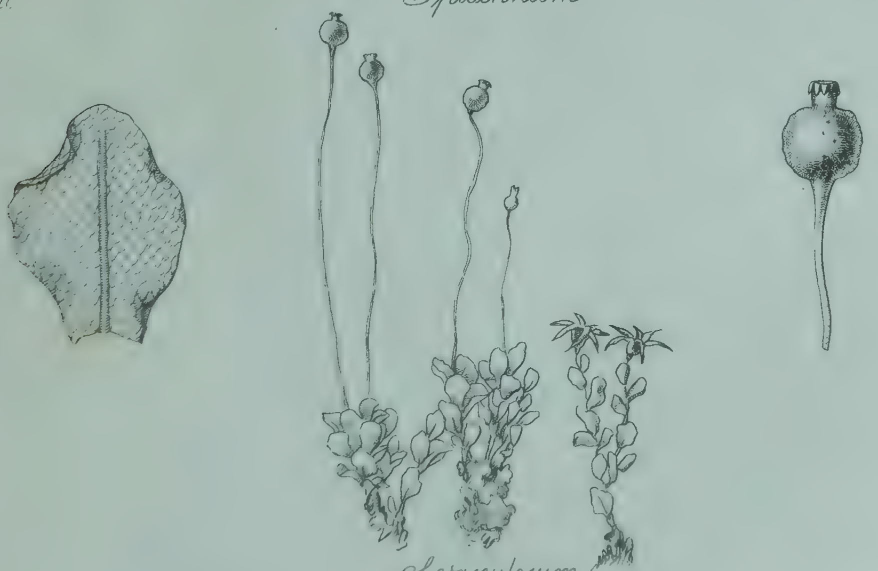


Mnium serratum.

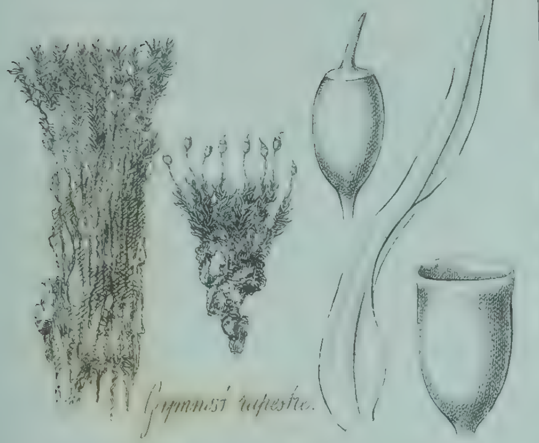


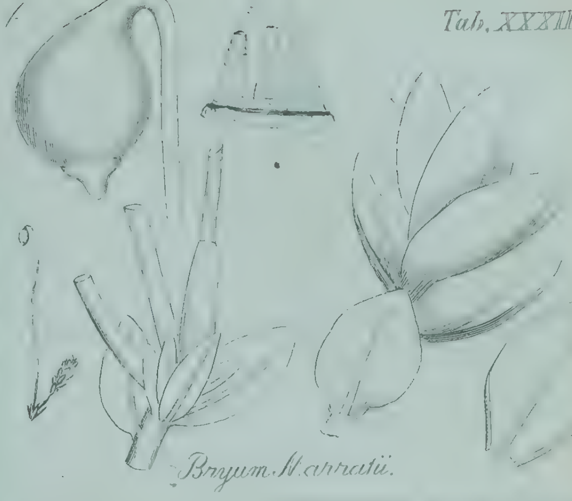
M. cuspidatum

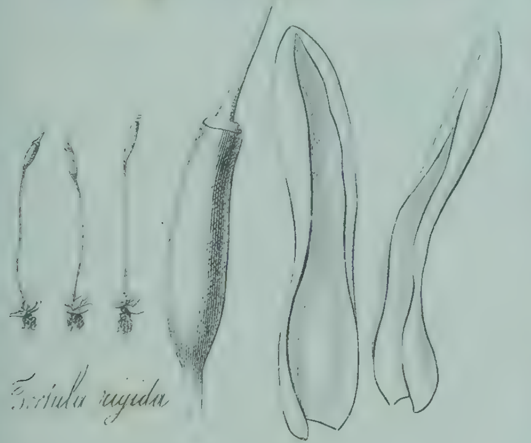
Splachnum

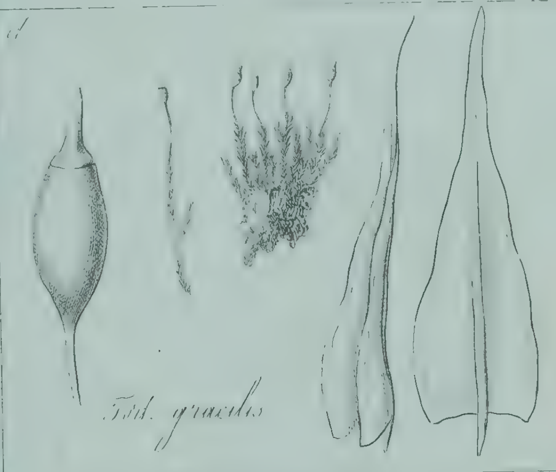


S. vasculosum

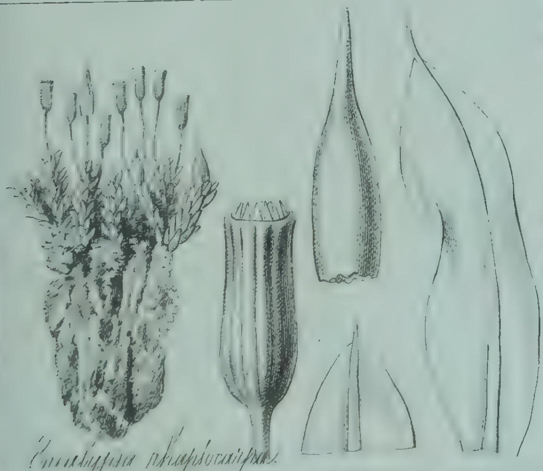

Gymnost. rupestre.

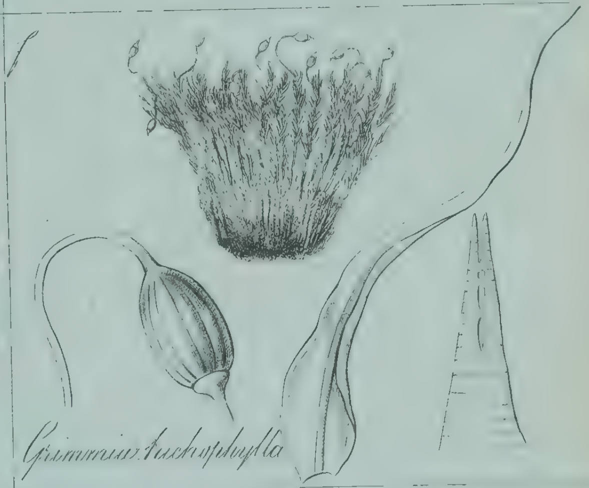

Bryum Marratii.


Tortula rigida

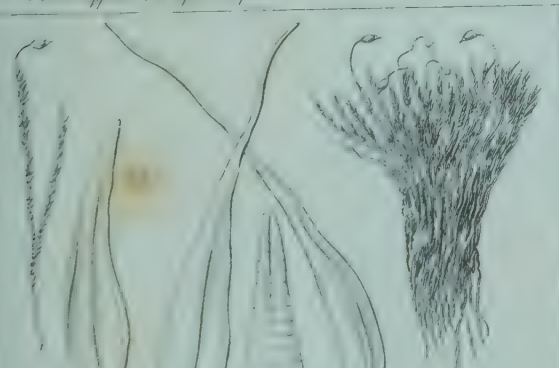


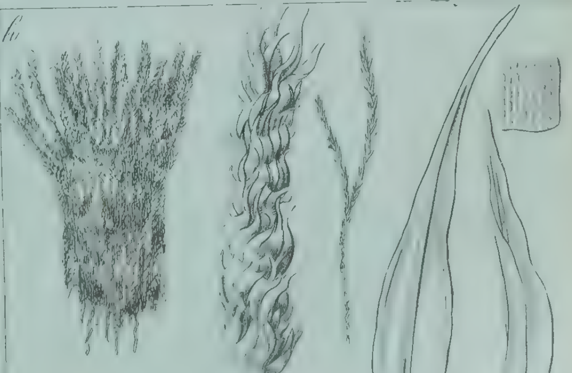
Tort. gracilis


Encalypta rhabdocarpa.



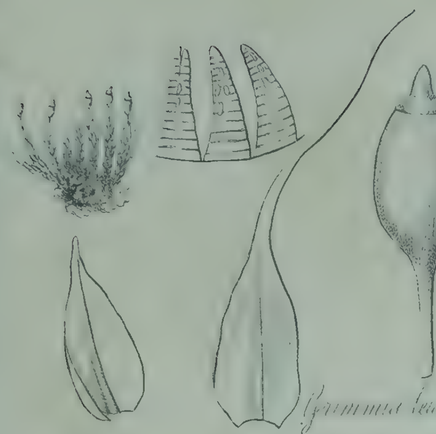
Grimmia trichophylla


Grimmia spiralis.

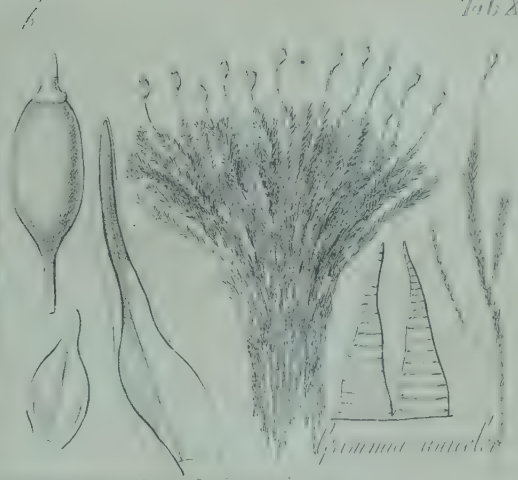


Grimmia torta

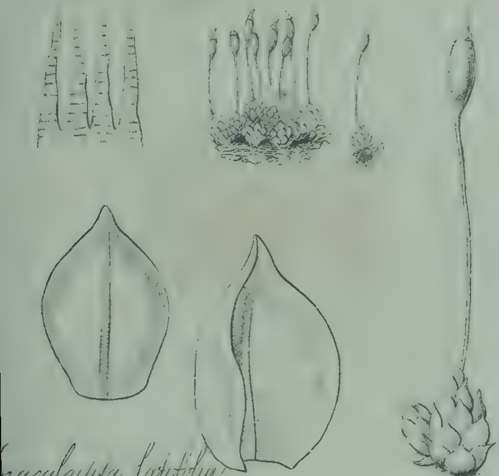
W. J. Hooker Esq. del.



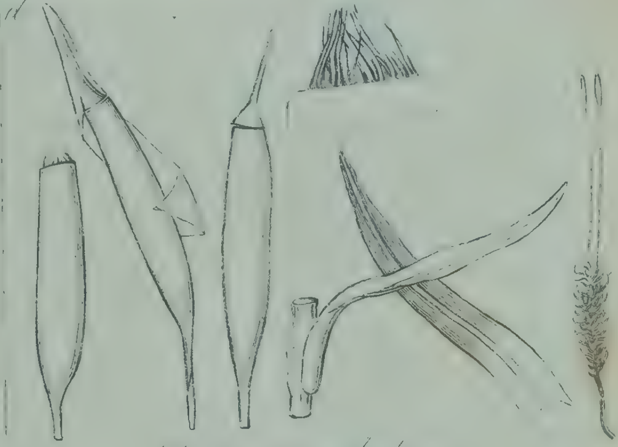
Grimmia leucophaea



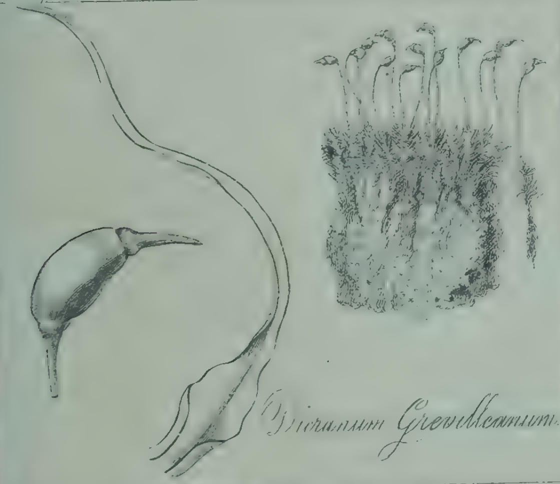
Grimmia unicolor



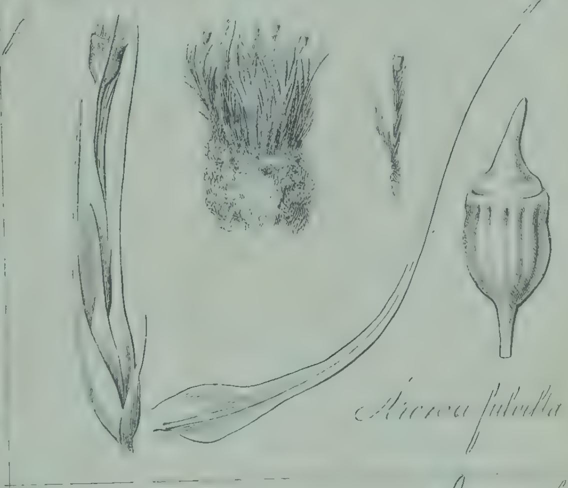
nacalypta latifolia



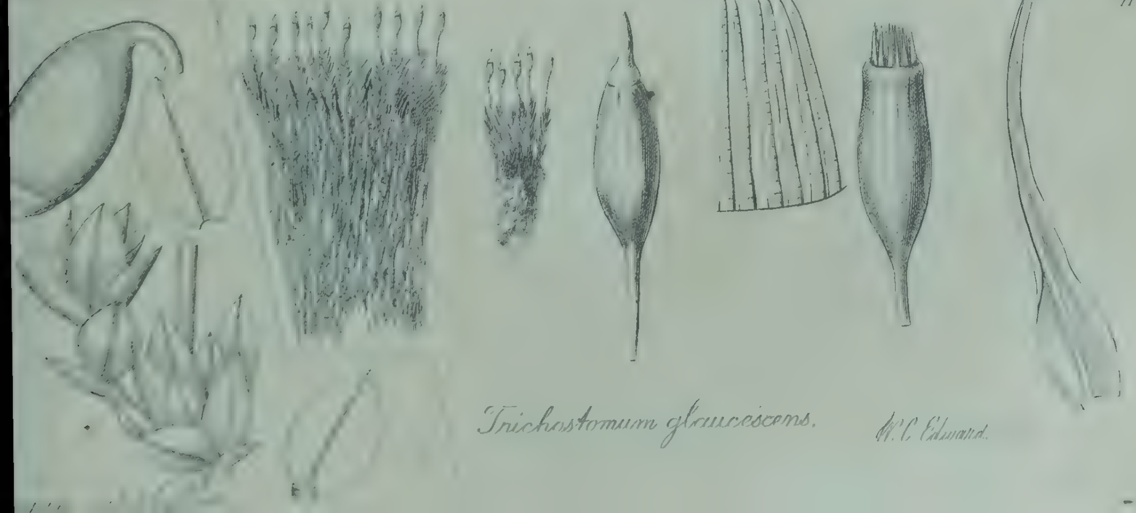
Didymodon cylindricus



Dicranum Grevilleanum.



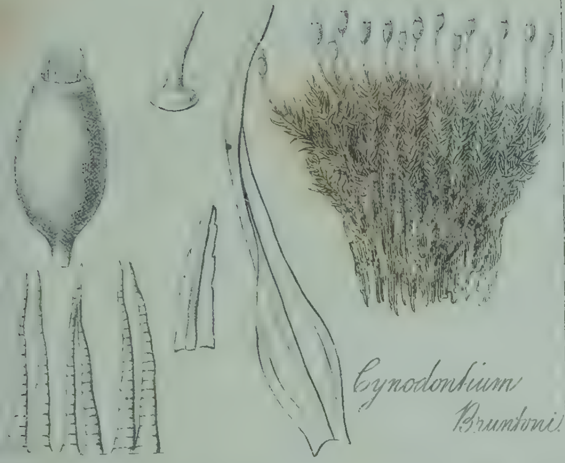
Arctoa fulvella



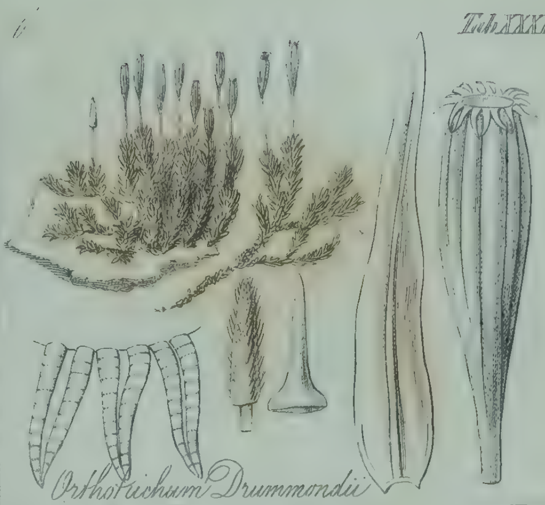
Trichostomum glaucescens.

W. C. Edward.

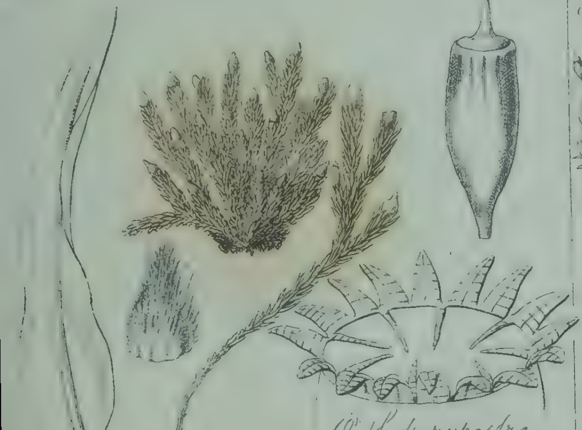
Tab. XXXIV.



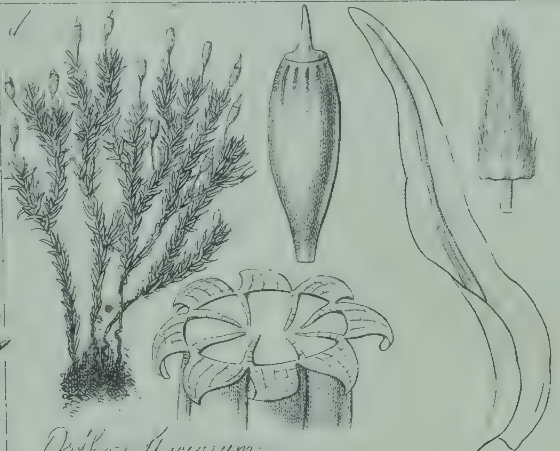
Cynodontium Bruntoni.



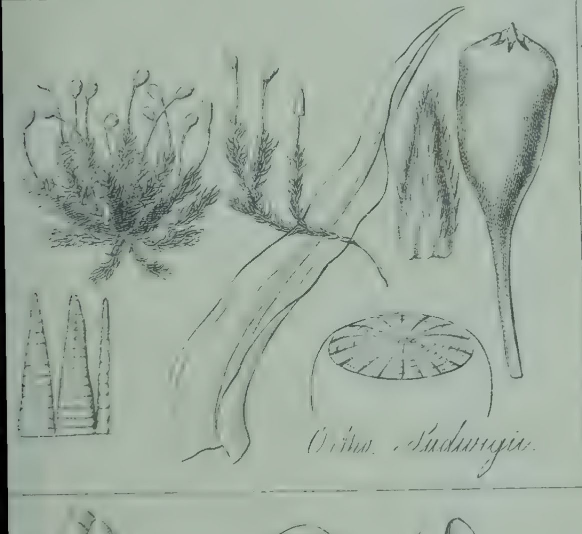
Orthotrichum Drummondii



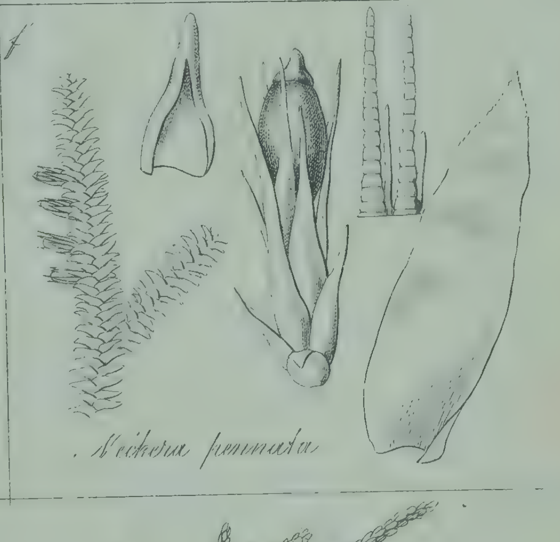
Orthotr. rupestre



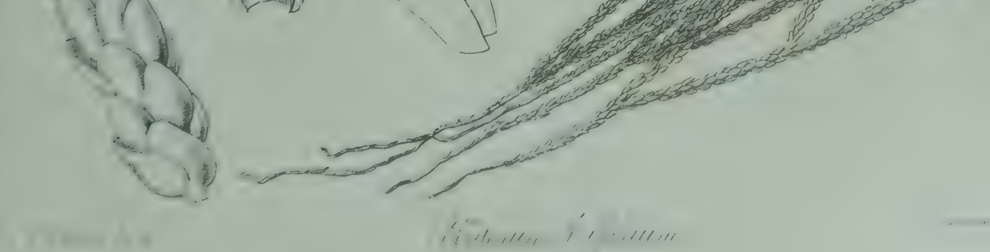
Ortho: Speciosum.



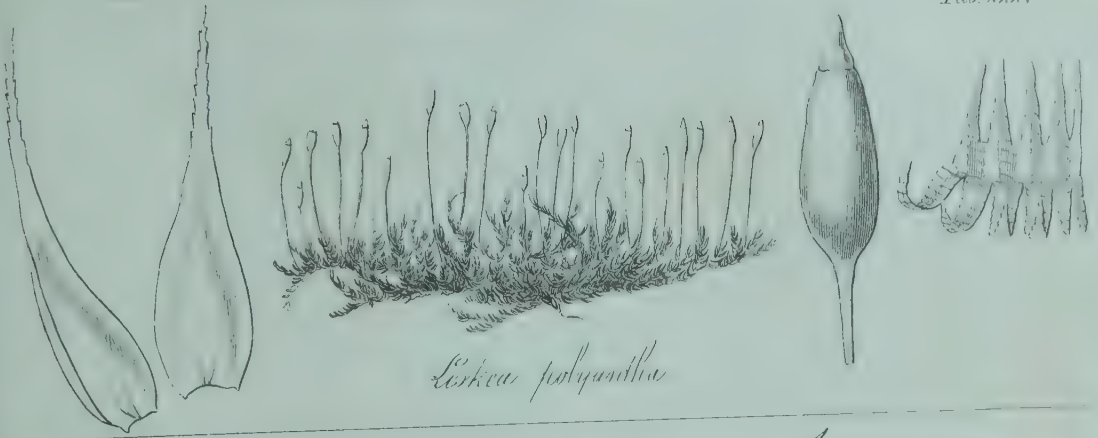
Ortho. Ludwigii.



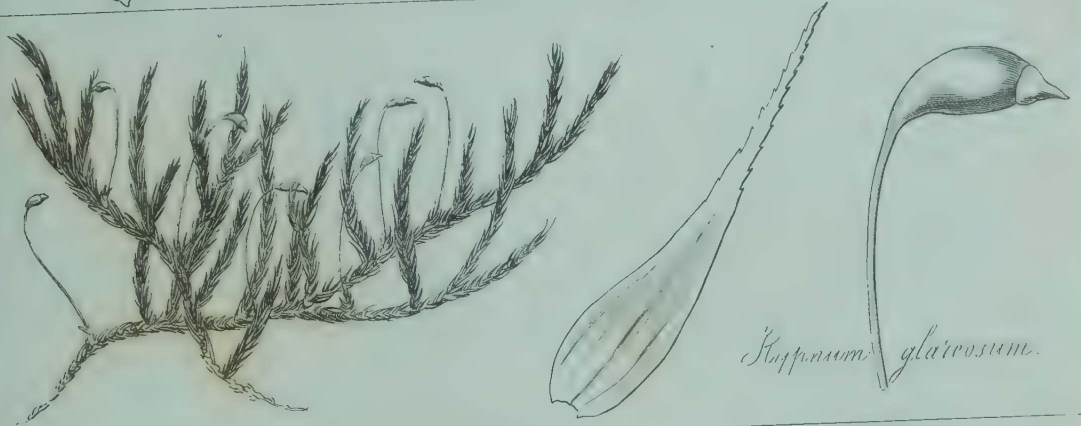
Neckera pennata



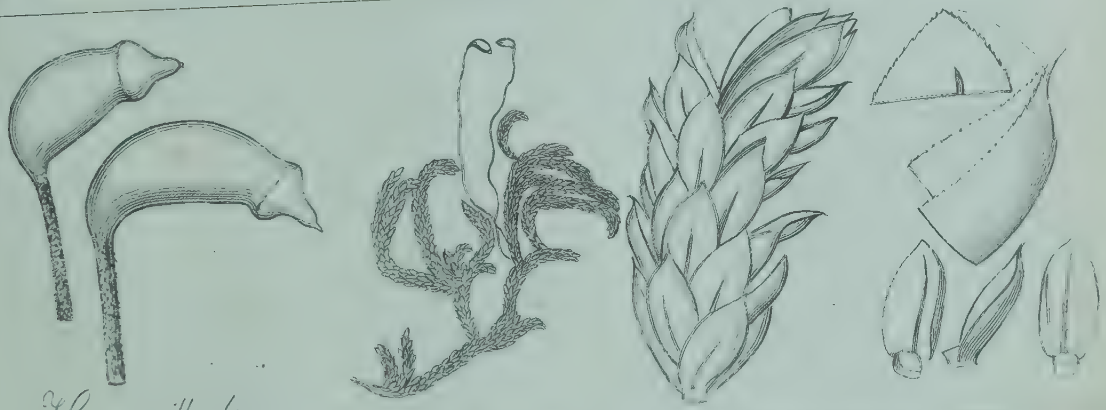
[illegible]



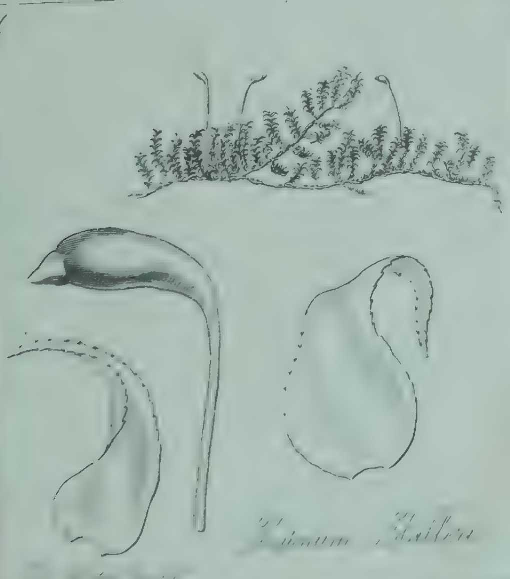
Leskea polyantha



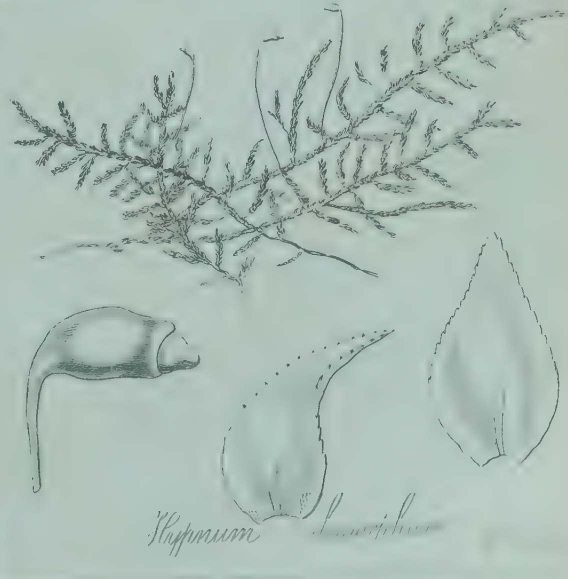
Hypnum glareosum.



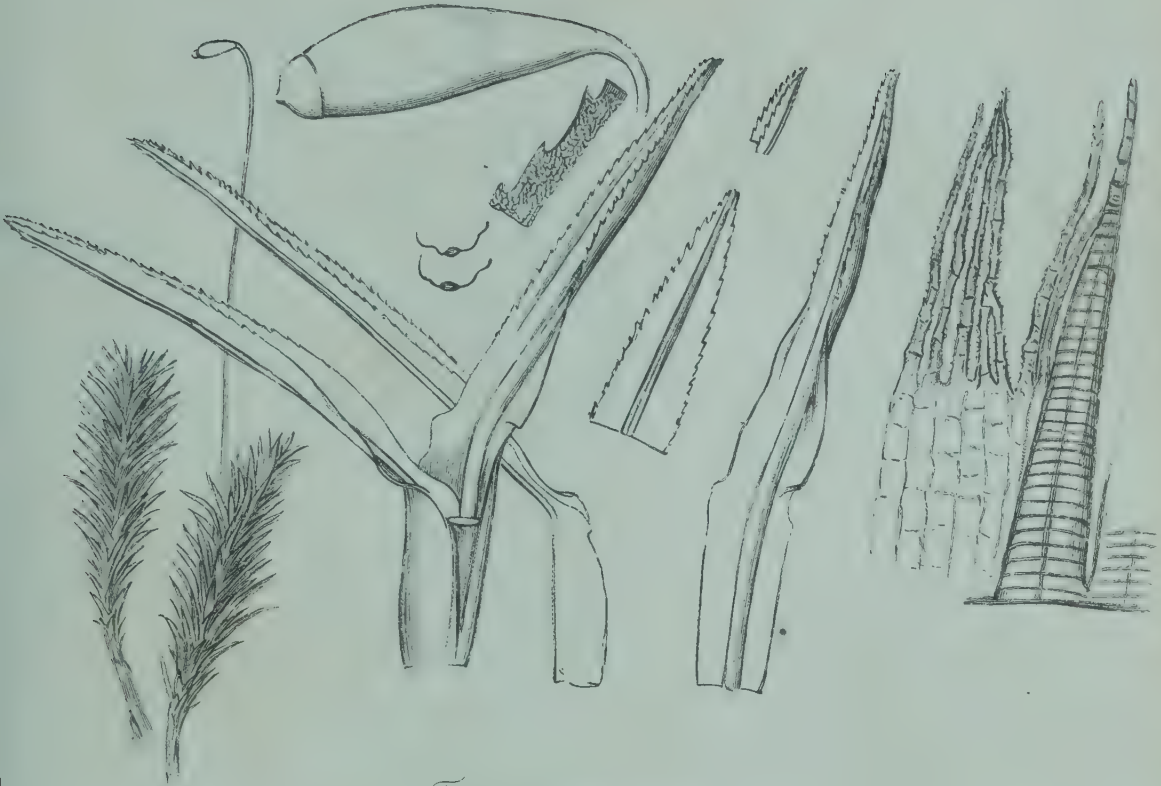
Hypnum illecebrum



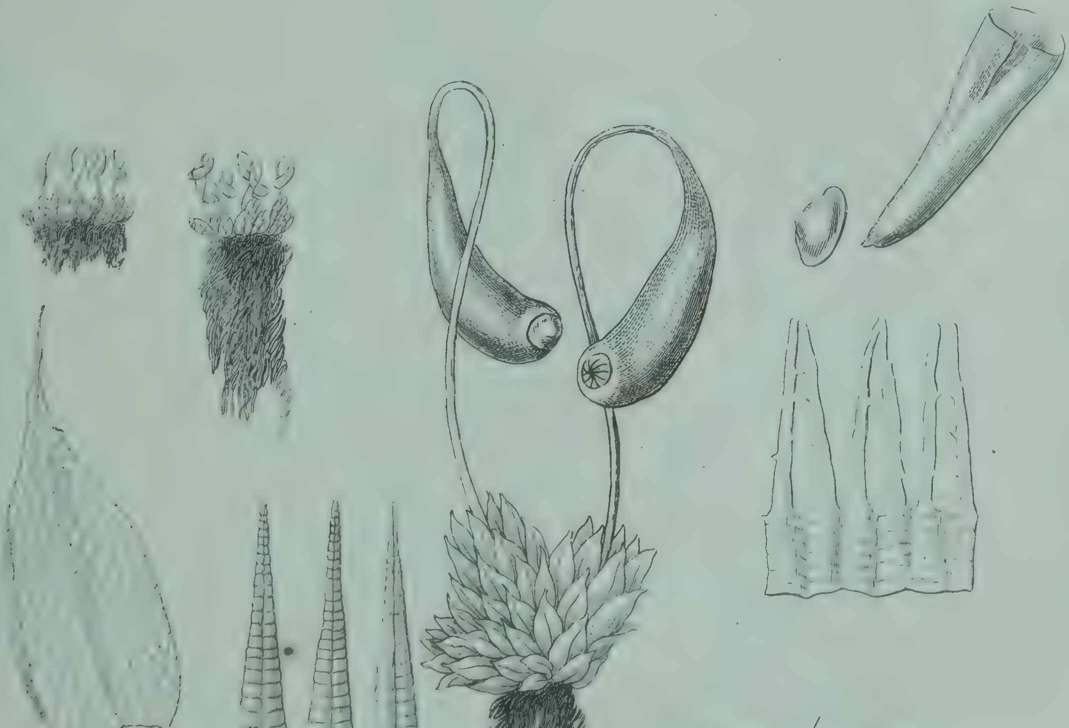
Hypnum Halleri



Hypnum [illegible]

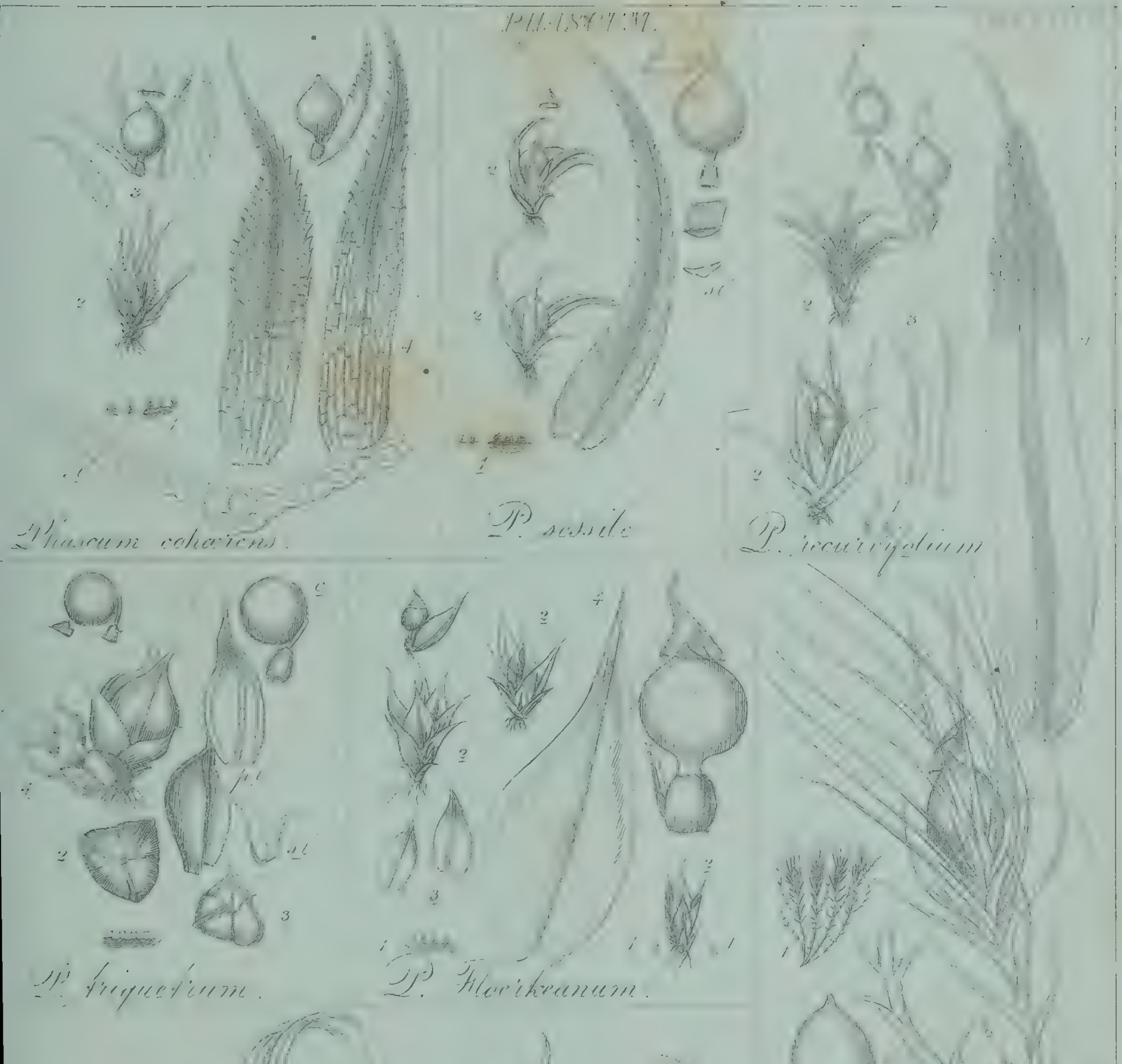


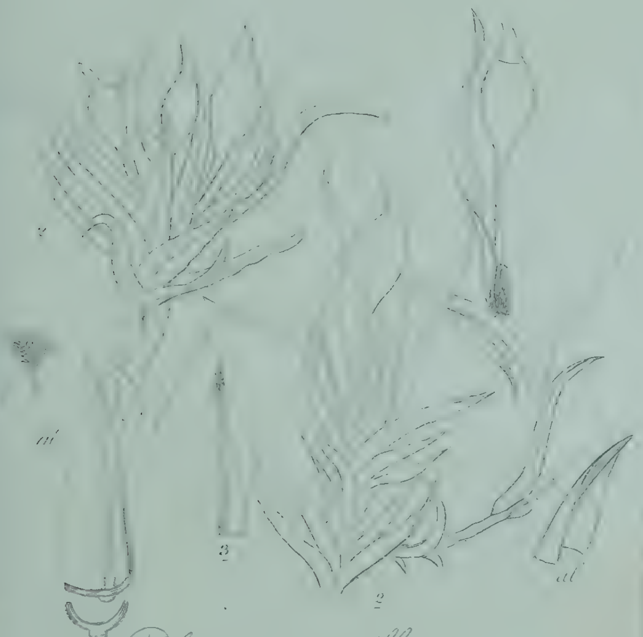
Timmia austriaca.



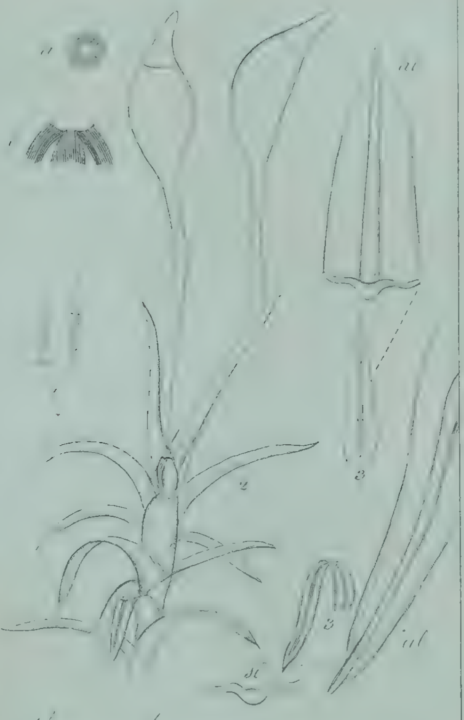
Bryum demissum

PHASCUM.


Phascum cohaerens.
P. sessile
P. recurvifolium
P. triquetrum.
P. Floerkeanum.
P. alternifolium.
P. multicapsulare

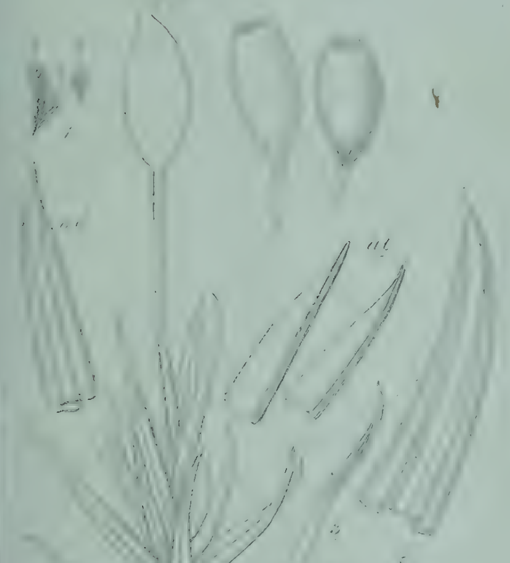


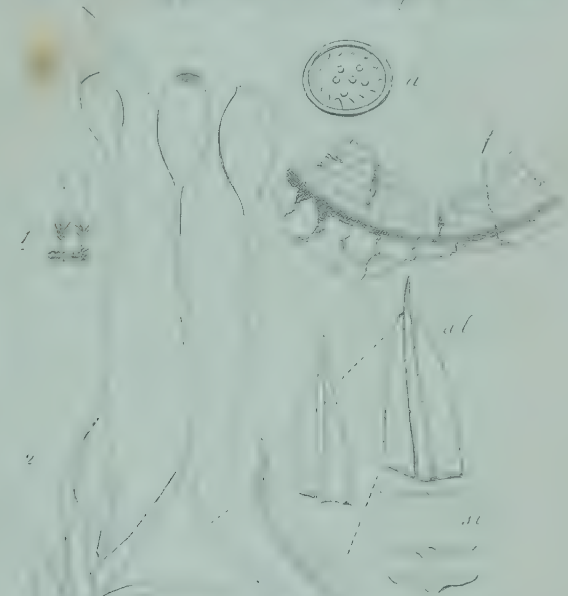
Phascum rostellatum.



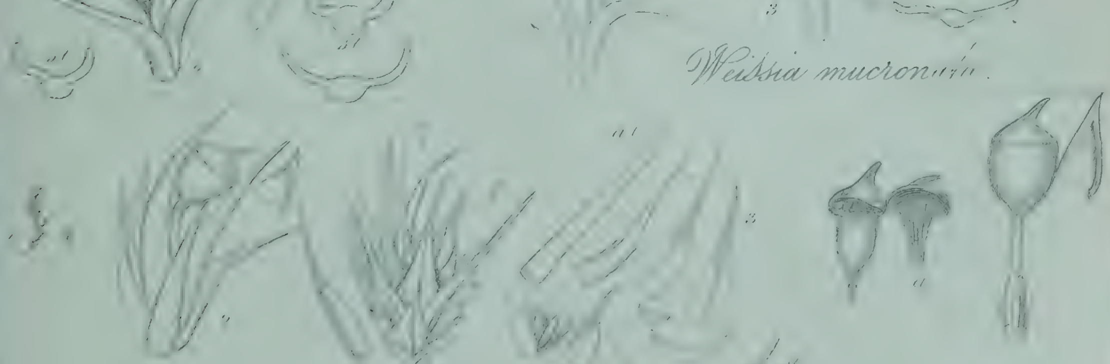
Gymnostomum squarrosum.

Gymnostomum tortile.

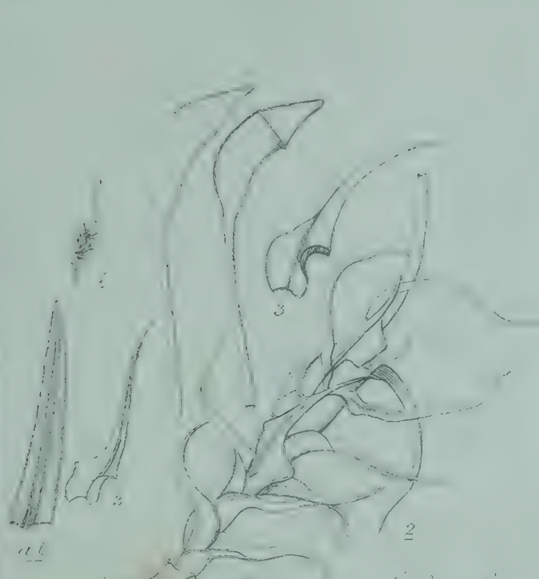




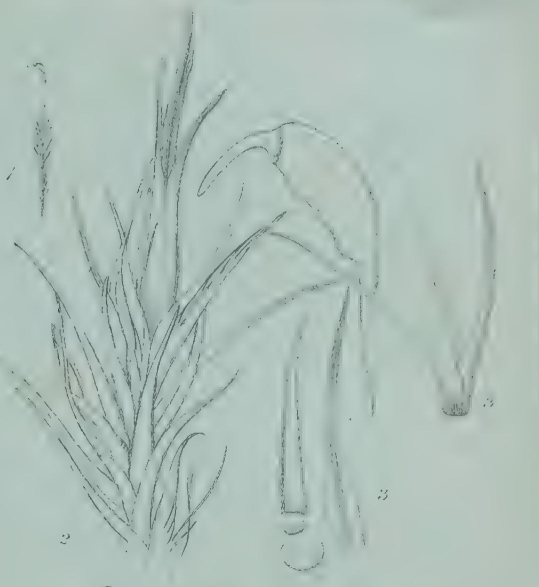
Weissia mucronata.



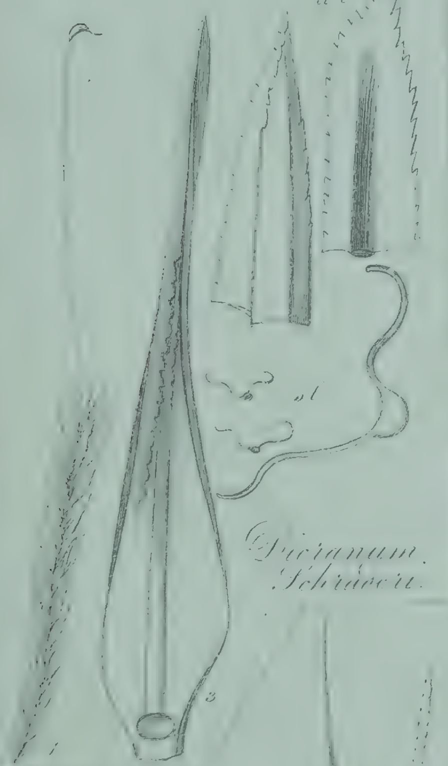
Stylostegium caespiticium.



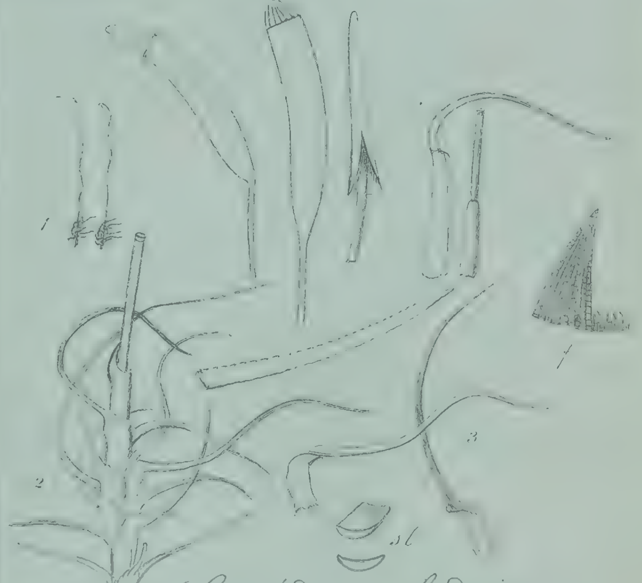
Dicranum Schreberi.



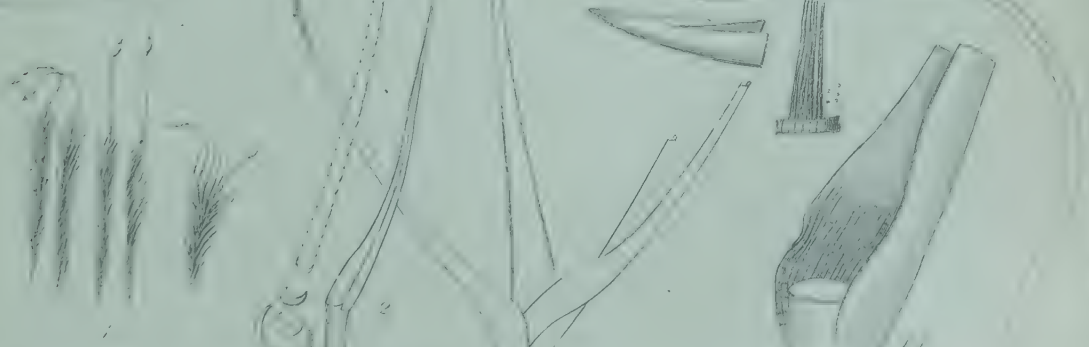
Dicranum Blyttii.



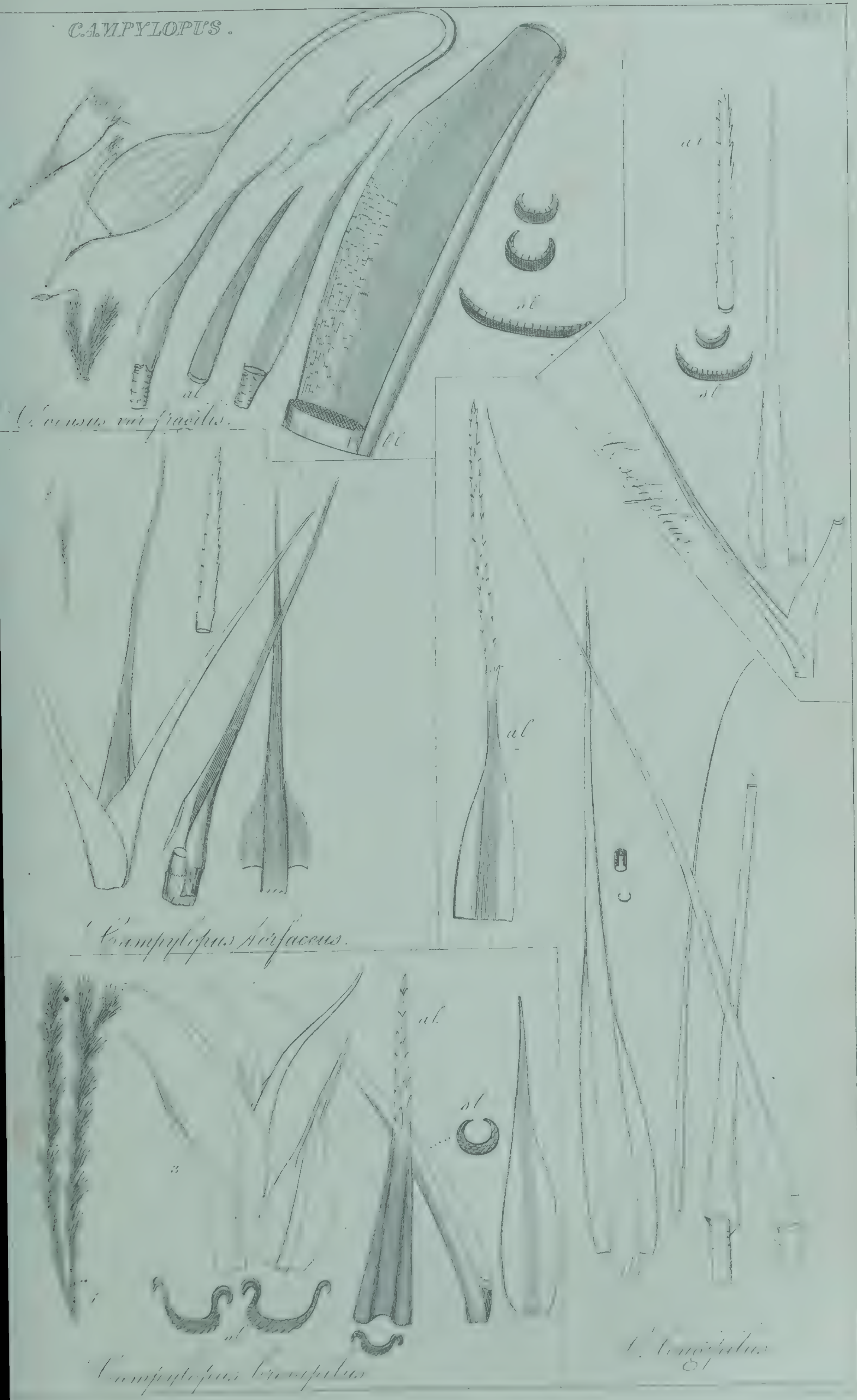
Dicranum Schraderi.

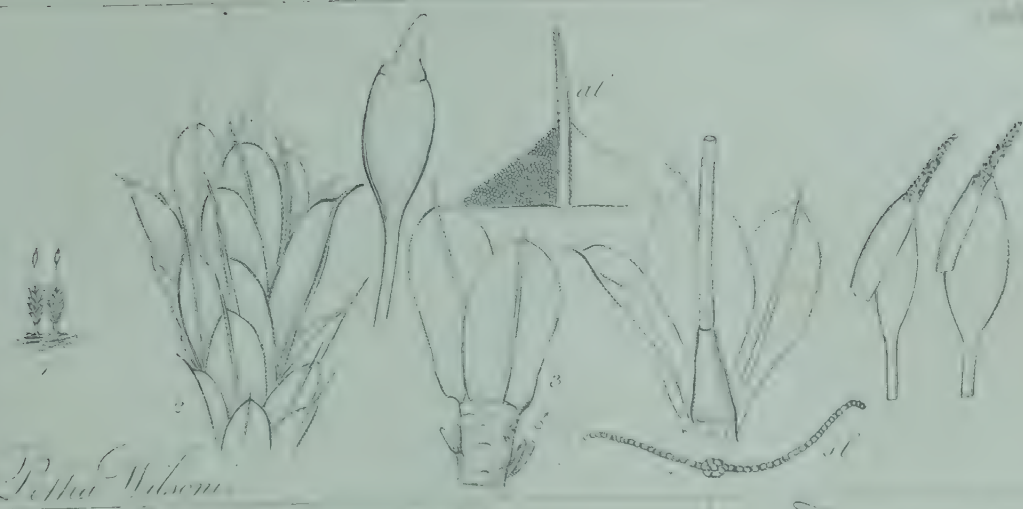


Ceratodon cylindricus

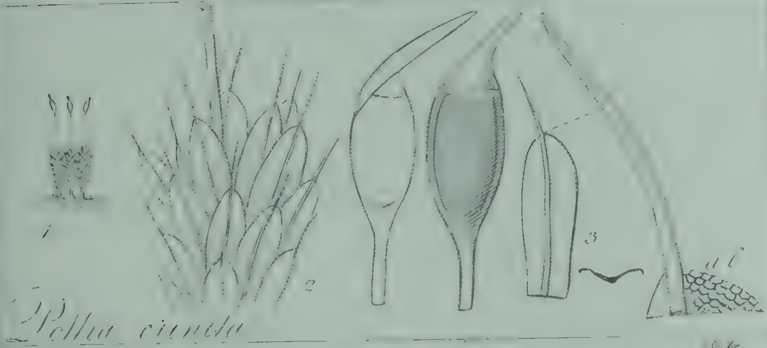


Dicranodontium [illegible]

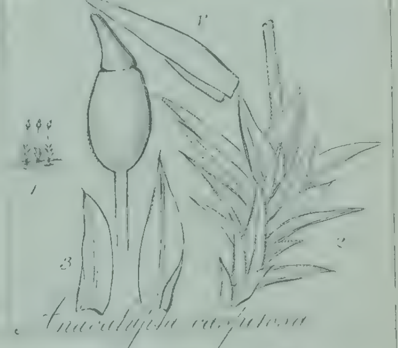

CAMPYLOPUS.
al
sl
bl
C. densus var. fragilis.
al
al
sl
C. setifolius.
al
Campylopus sericeus.
al
sl
al
Campylopus brevipilus
C. longipilus
81



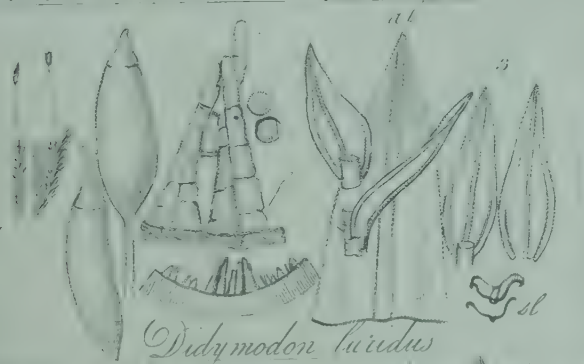
Pottia Wilsoni



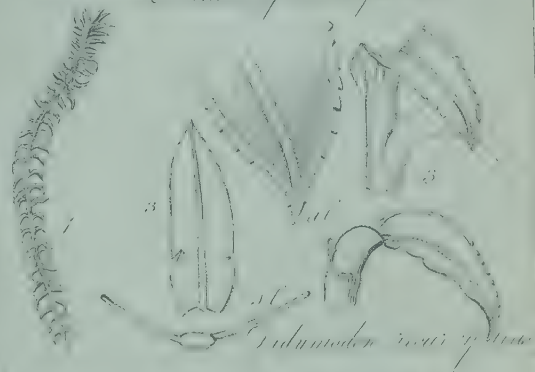
Pottia crinita



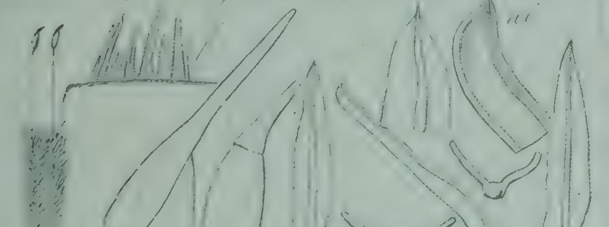
Anacalypta caespitosa



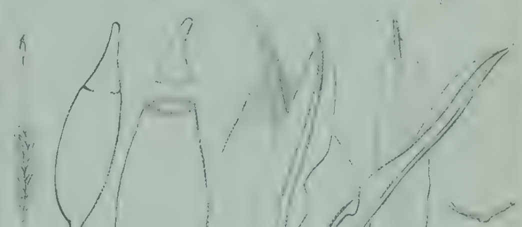
Didymodon luridus



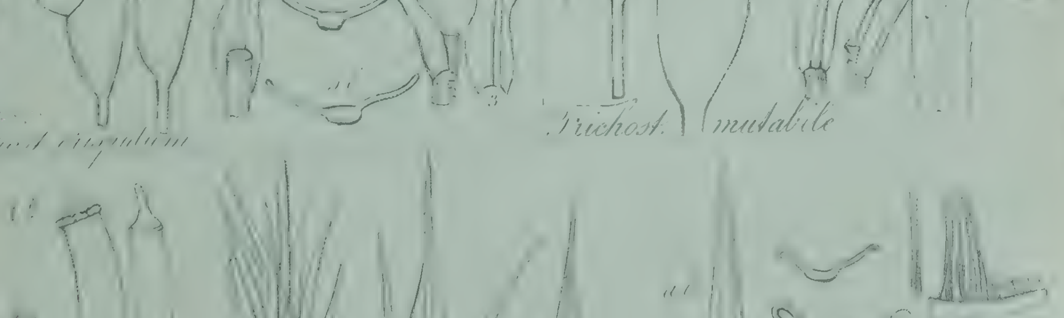
Didymodon recurvifolius



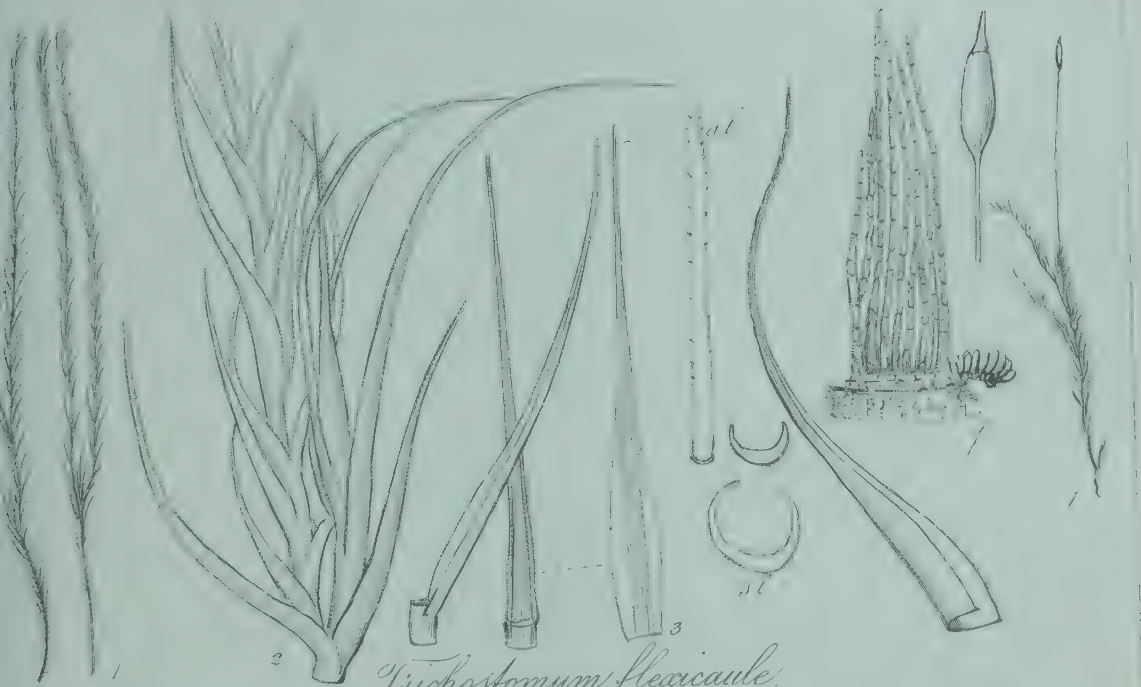
Trichost. crispulum



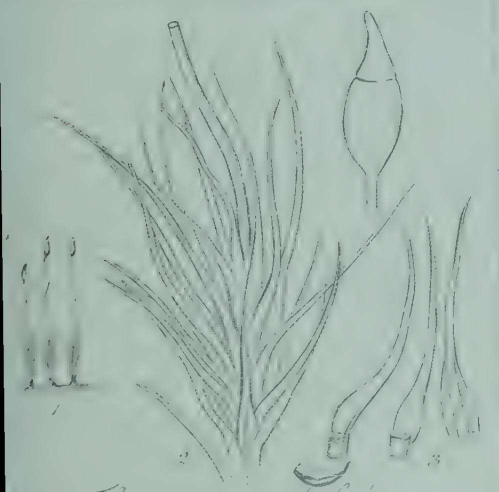
Trichost. mutabile



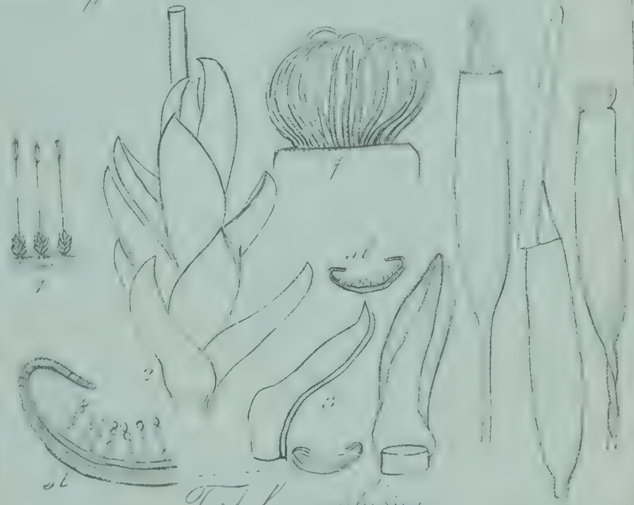
Trichostomum [illegible]



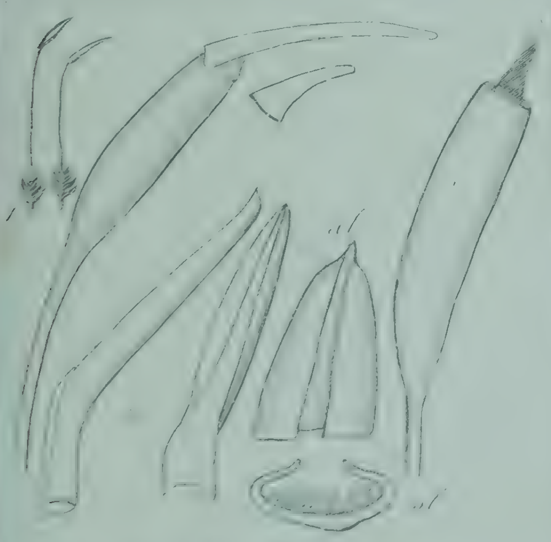
Trichostomum flexicaule.



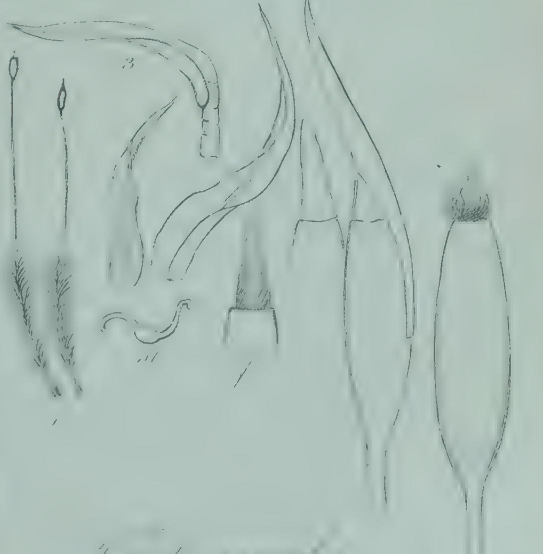
Trichostomum subulatum.



Tortula ambigua.

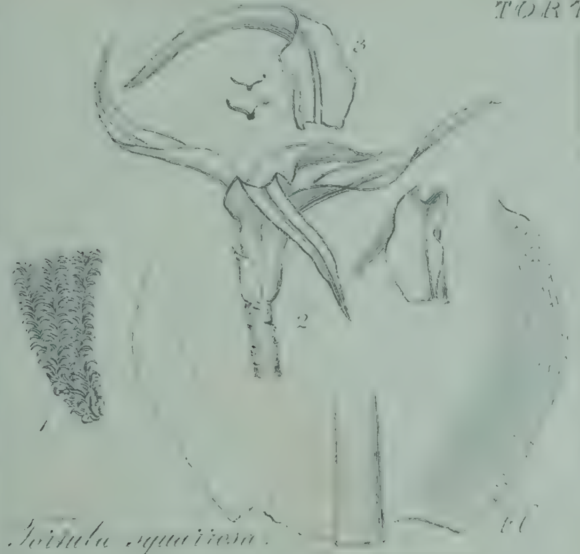


[illegible]

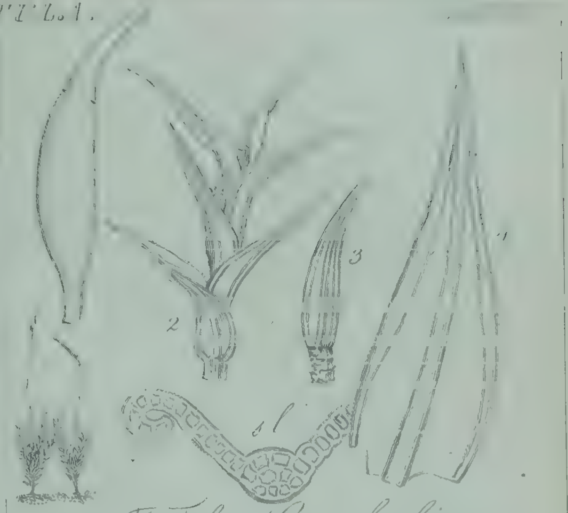


Tortula [illegible]

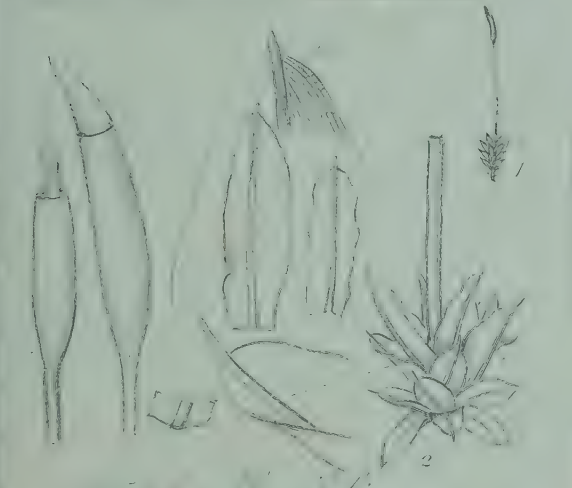
TORTULA.



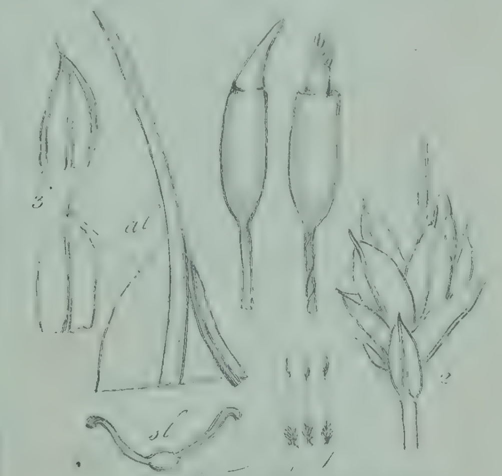
Tortula squarrosa.



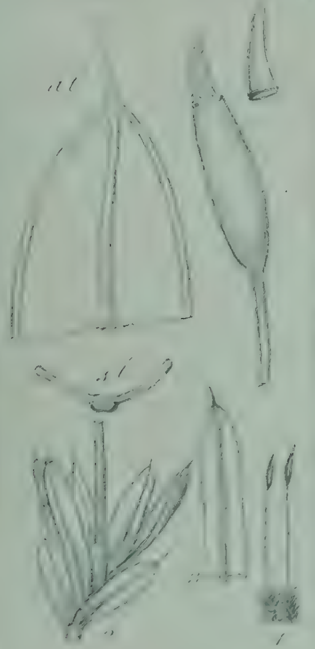
Tortula Hornschuchiana.



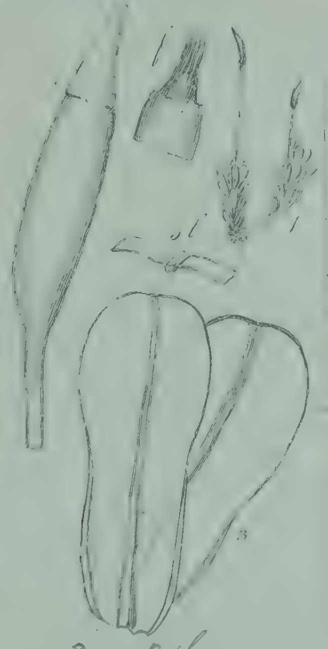
Tortula oblongifolia.



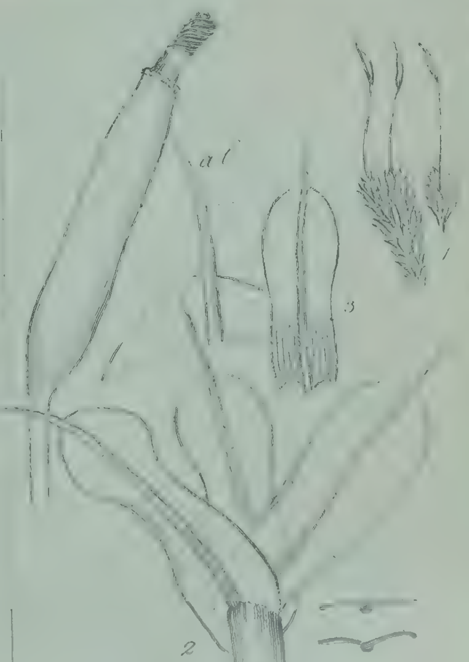
Tortula canescens.



T. marginata.

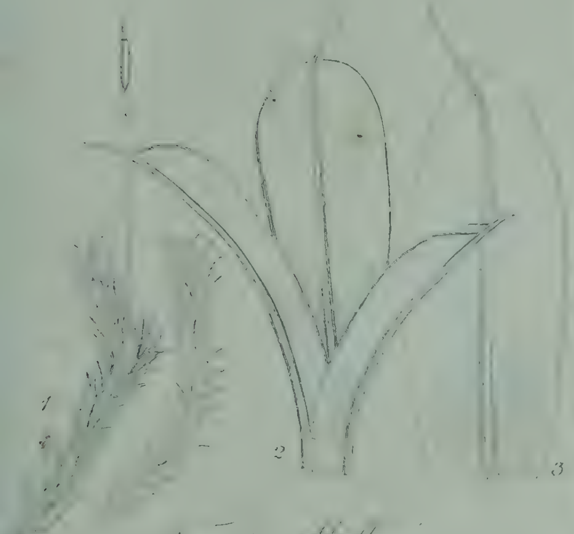


T. latifolia.

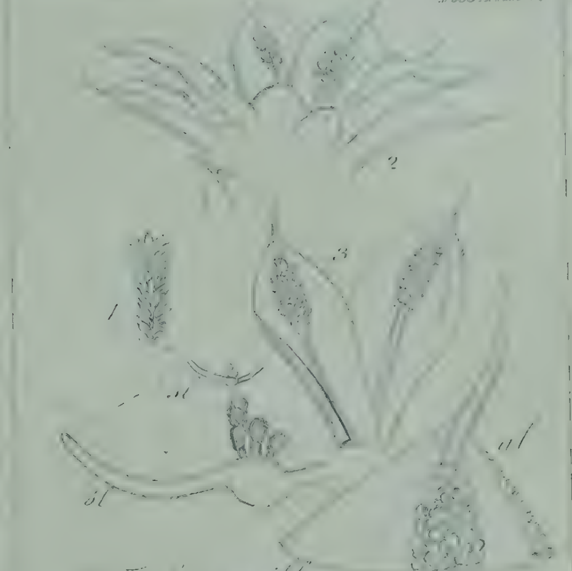


Tortula lævipila.

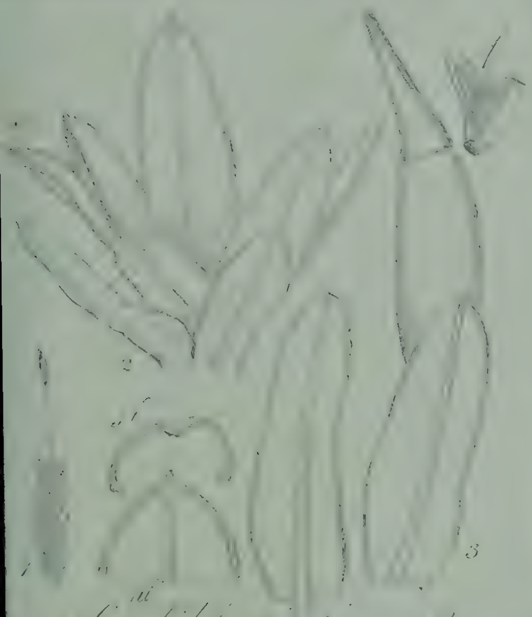
Tab. XLVI.



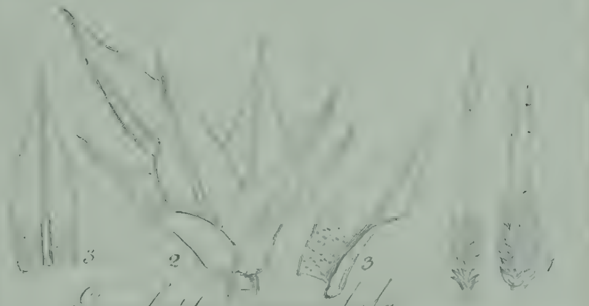
Tortula Mülleri.



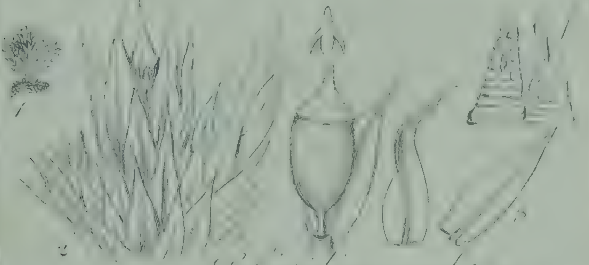
Tortula papillosa.



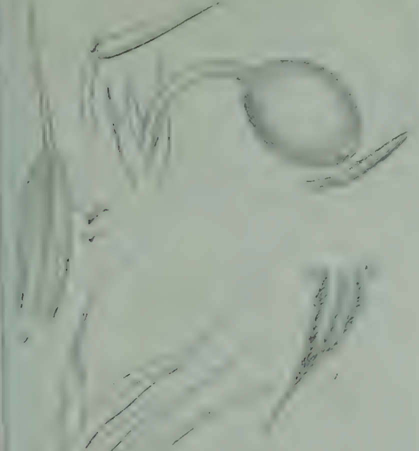
Cinclidotus riparius, var. β.



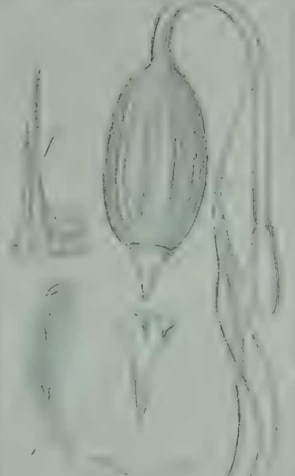
Encalypta commutata.



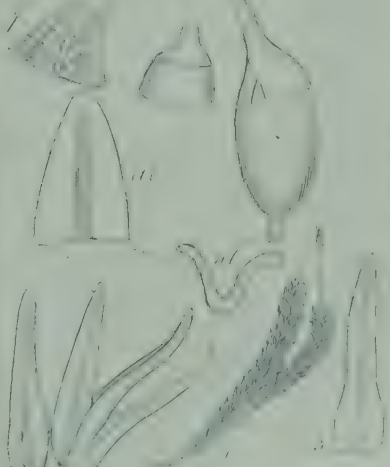
Schistidium confertum.



Grimmia orbicularis.



Gr. Schultzii.

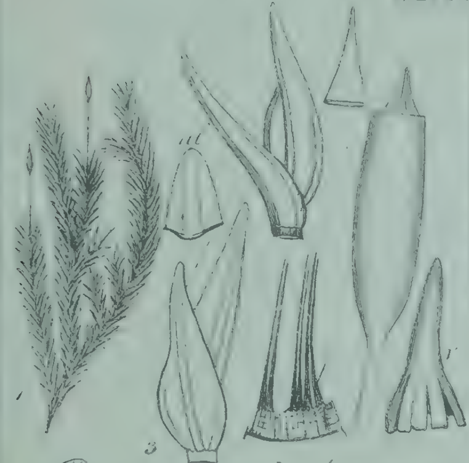


Gr. atrata.

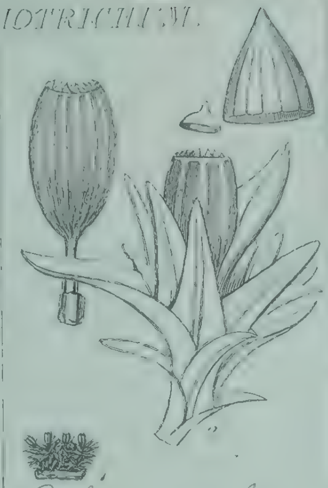
G. Adlard sc.

ORTHOTRICHUM.

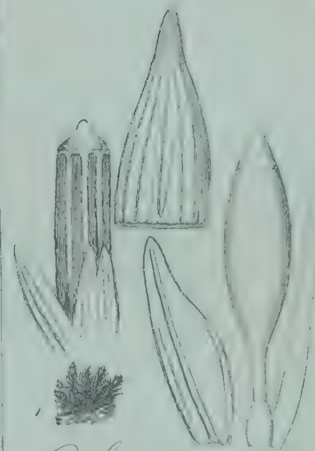
Tab. XLV.



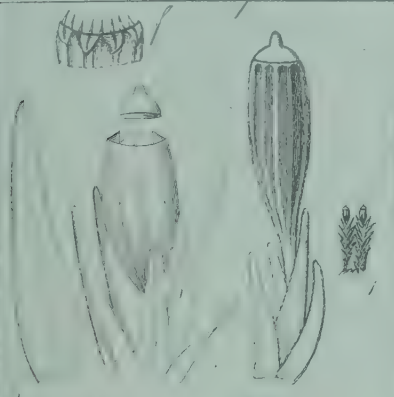
Racomitrium protensum.



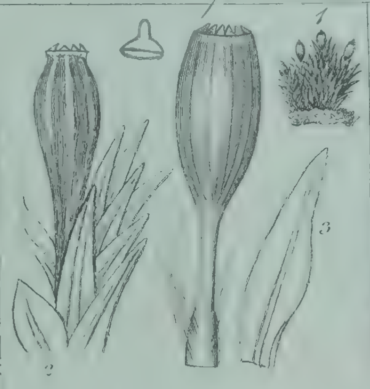
Orthot.^{m} pumilum



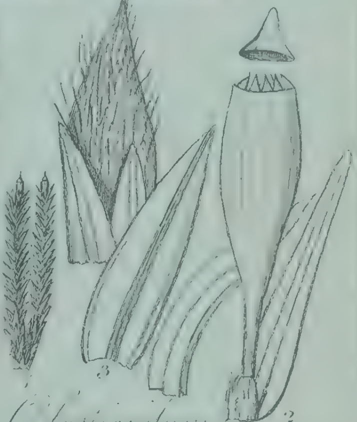
Orthot.^{m} tenellum



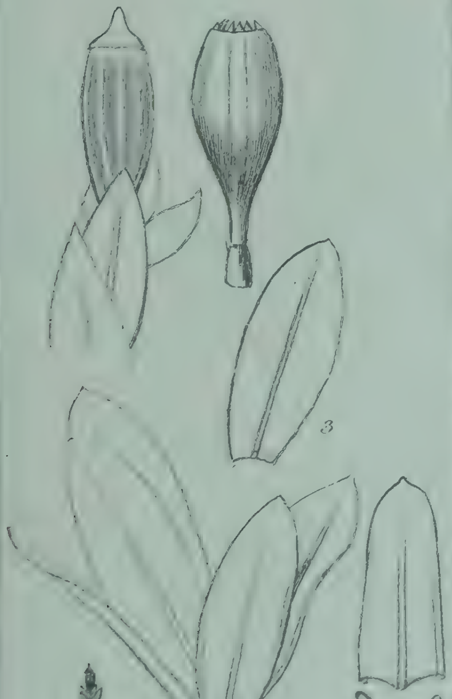
Orth. pallens.



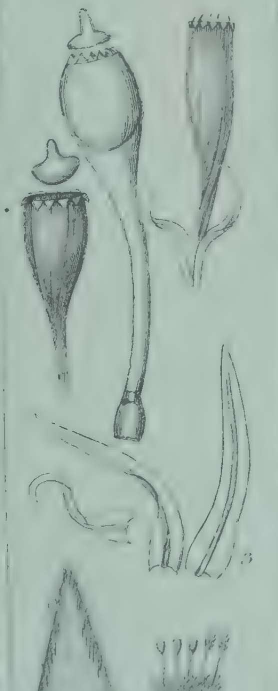
Orth. stramineum.



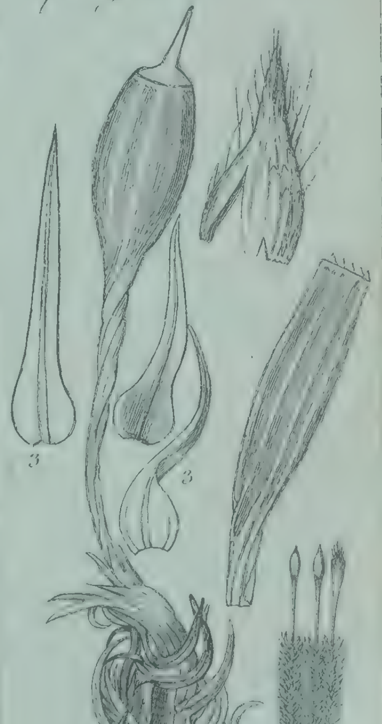
O. fastigiatum.



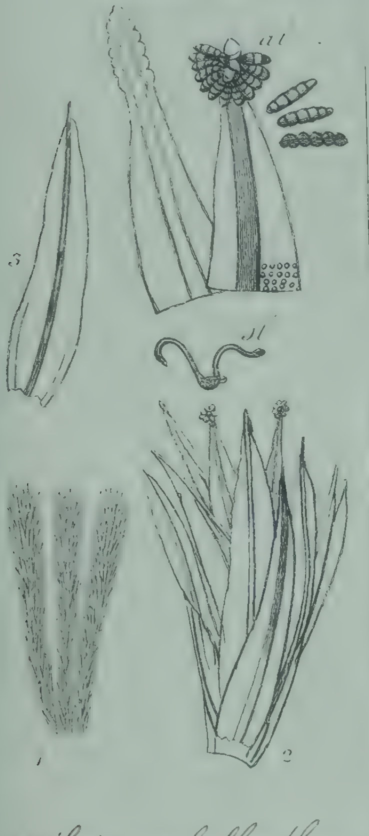
Orth. Sprucei



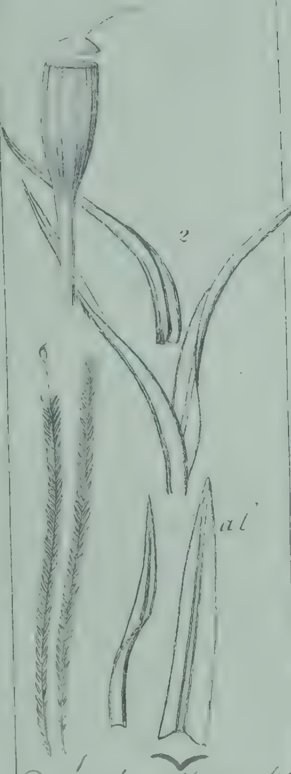
O. crispulum.



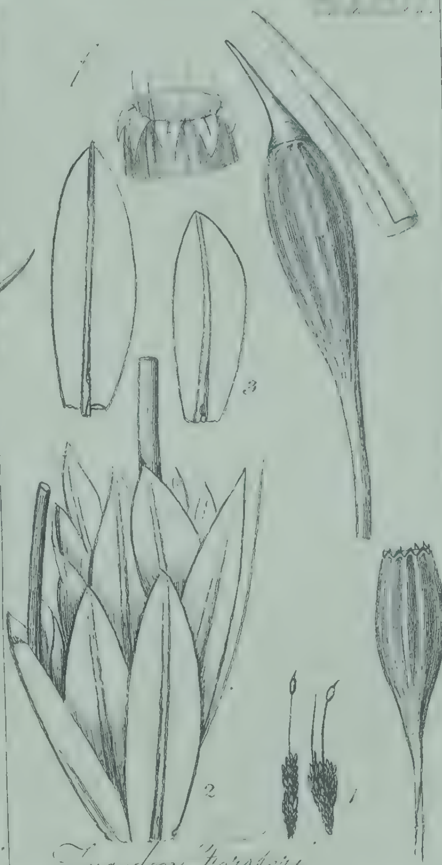
Orth. Bruchi



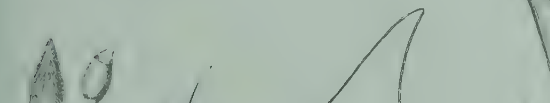
Orthotr.m phyllanthum.



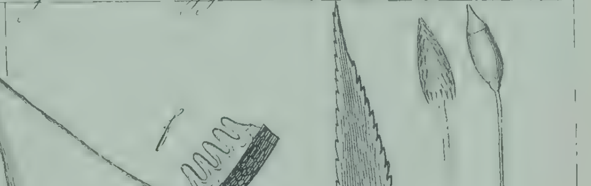
Zygodon Mougeotii.



Zygodon Forsteri.

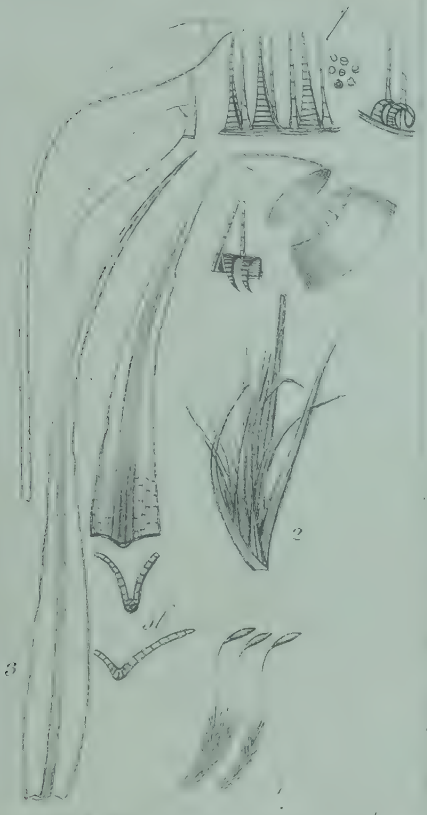


Polytrichum gracile.

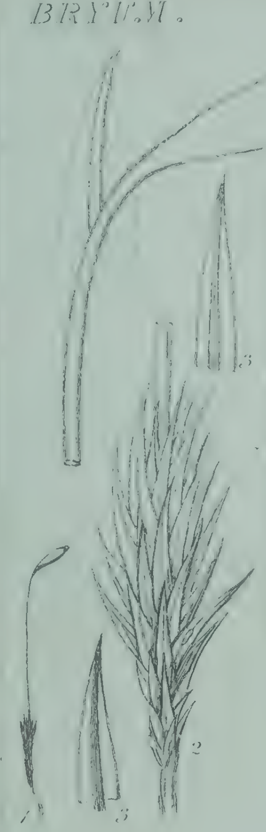


P. formosum.

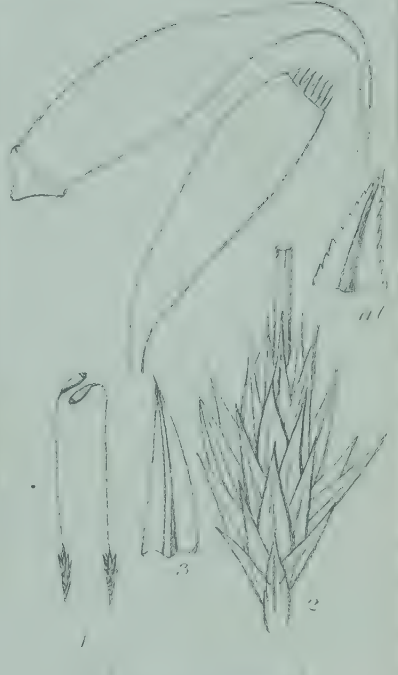
BRYUM.



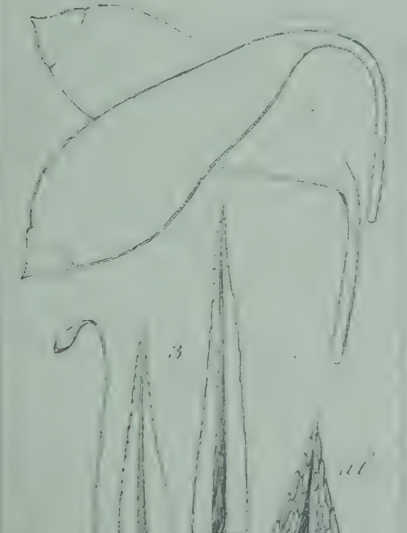
Orthodontium gracile.



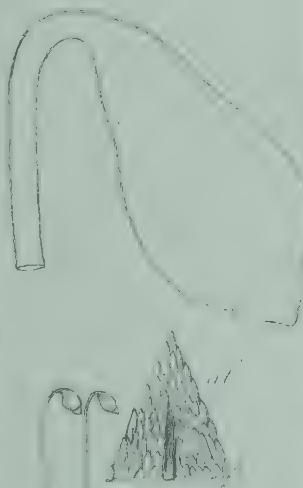
B. acuminatum.



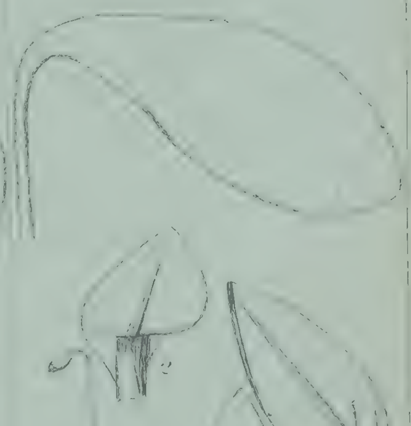
B. polymorphum.



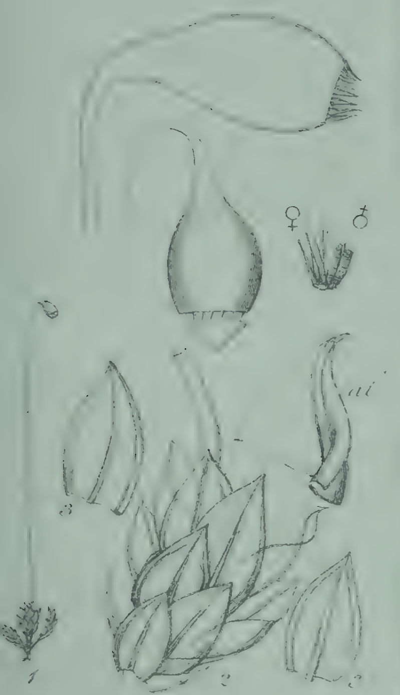
B. annotinum.



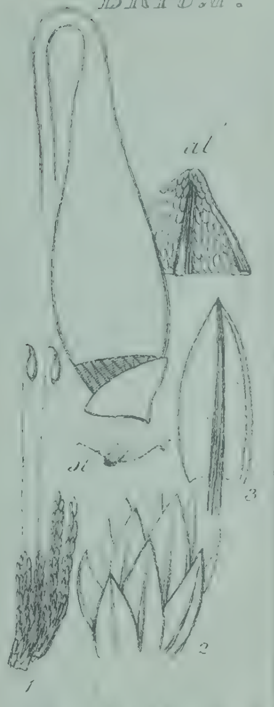
B. Wahlenbergii.



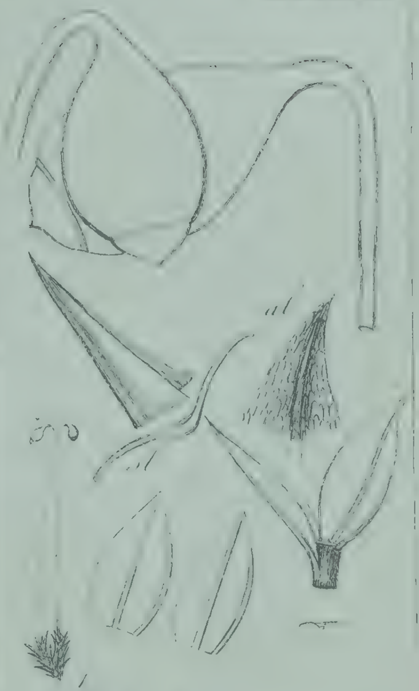
B. Ludwigii.



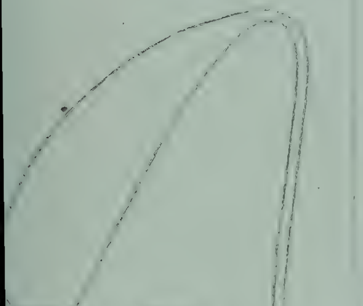
B. lacustre.



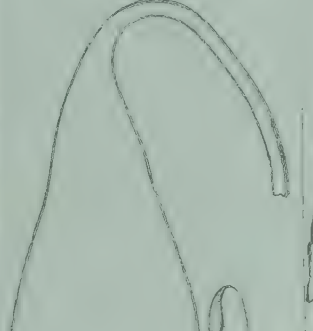
B. Mühlenbeckii



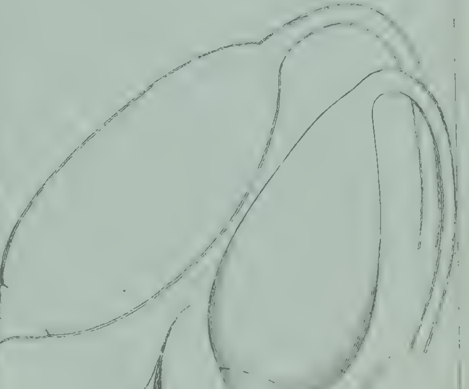
B. turbinatum.



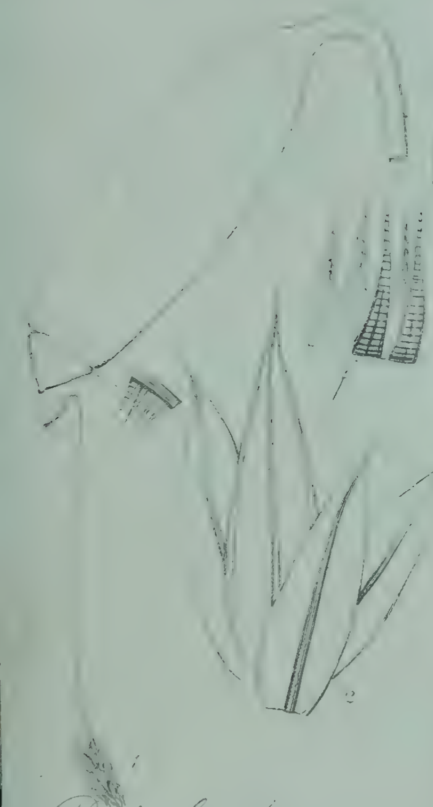
B. uliginosum.



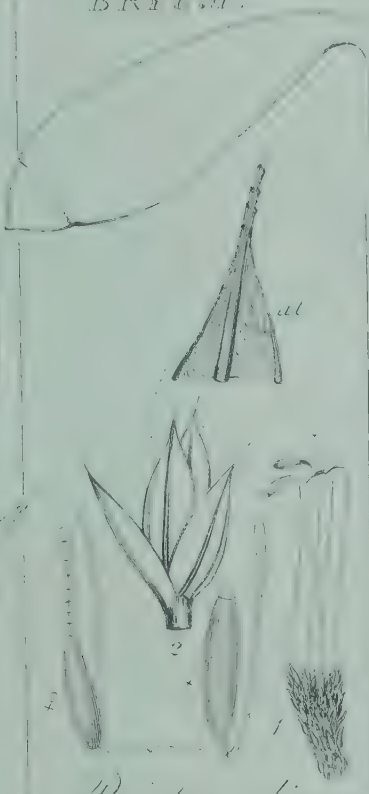
B. pallescens.



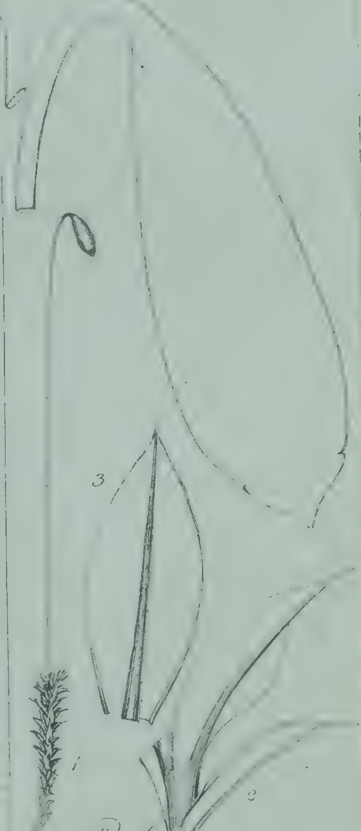
B. cernuum



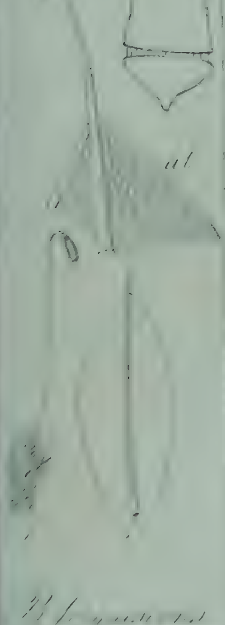
B. inclinatum.



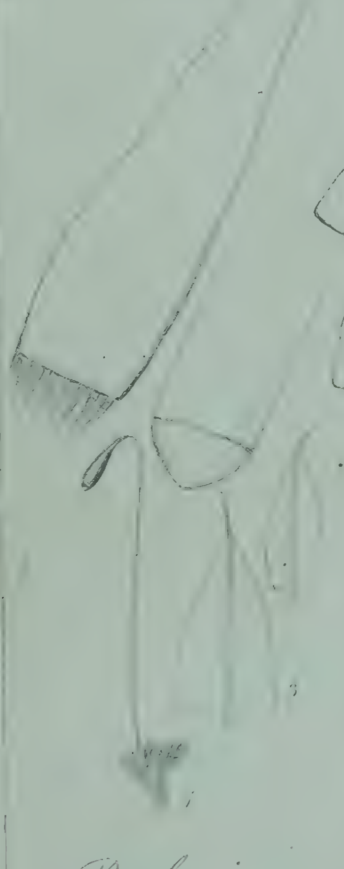
B. intermedium.



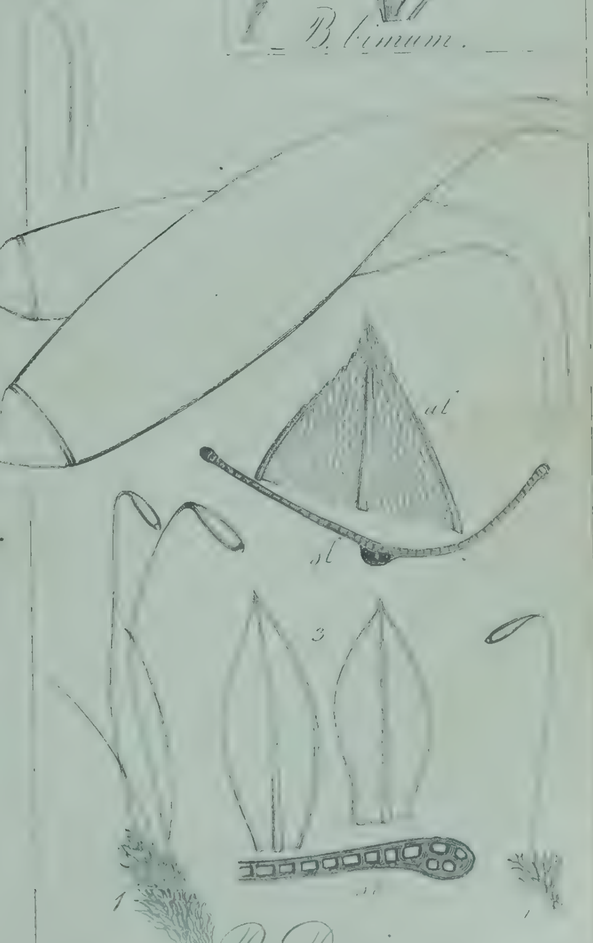
B. bimum.



B. [illegible]

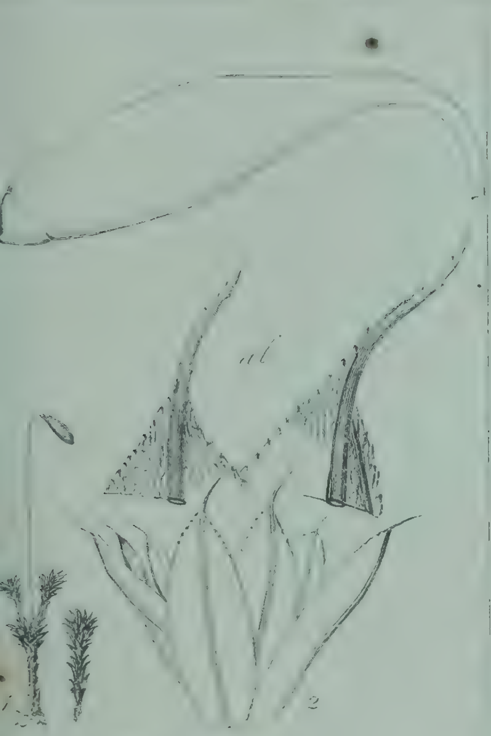


B. obconicum.

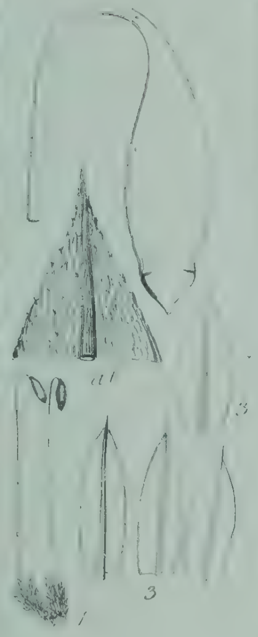


B. Donianum.

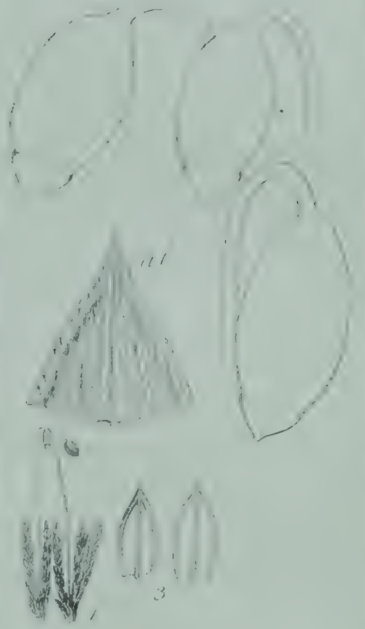
BRYUM.



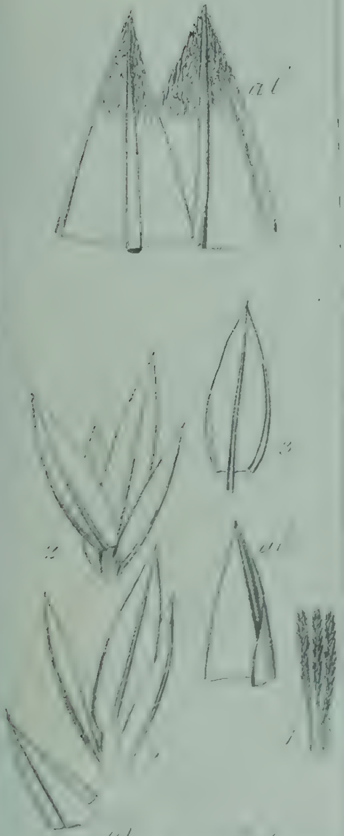
B. Billardierii



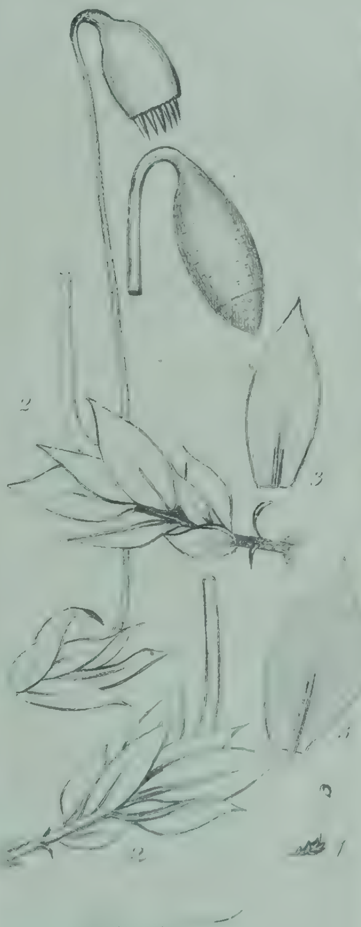
B. sanguineum.



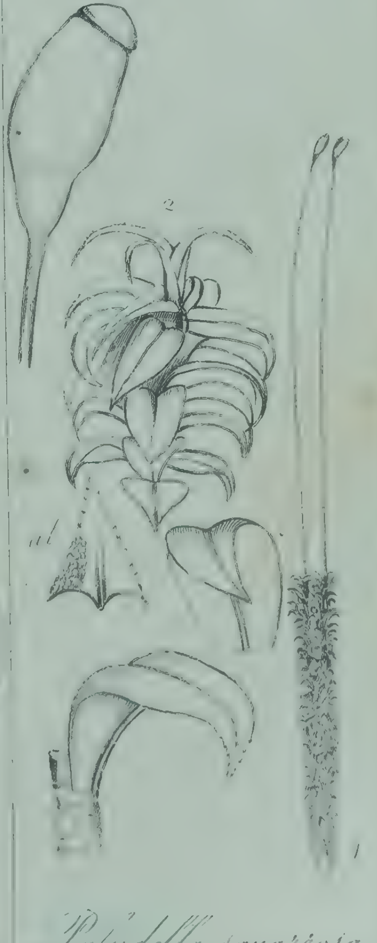
B. atropurpureum.



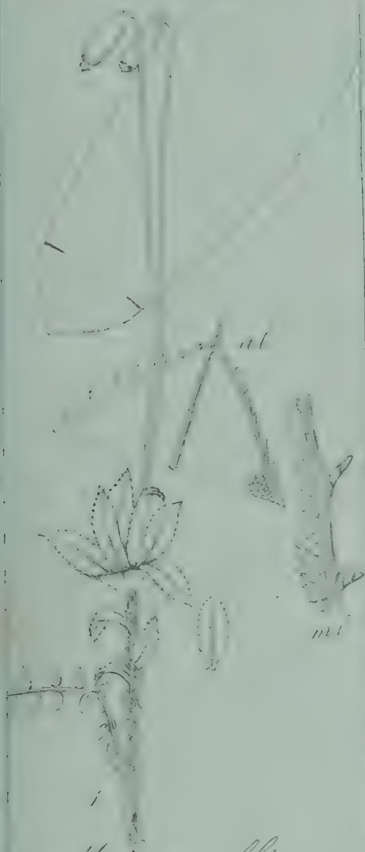
B. apiculatum.



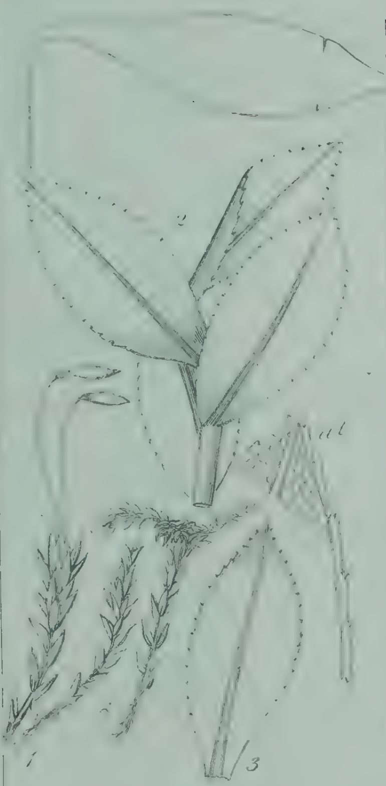
B. Zierii.



Paludella squarrosa.



Mnium affine



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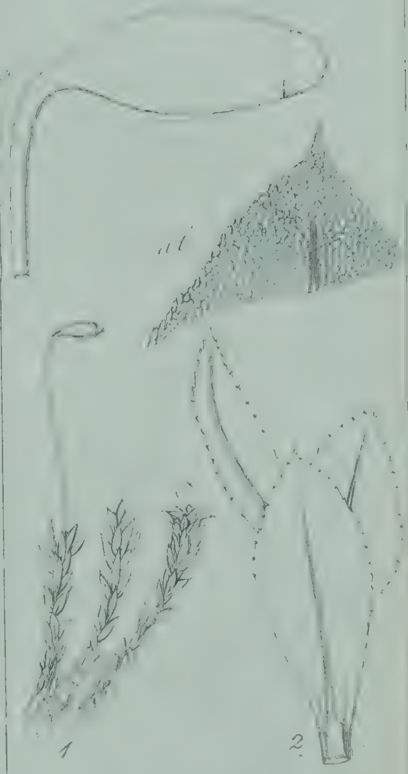
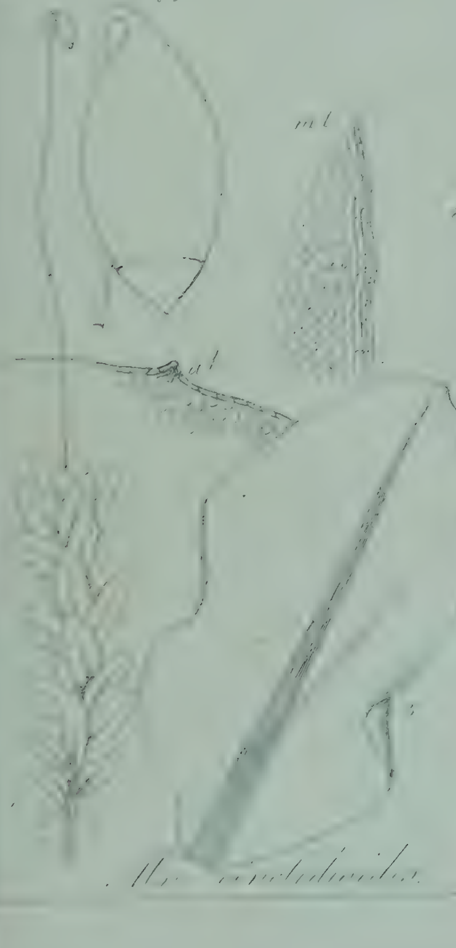
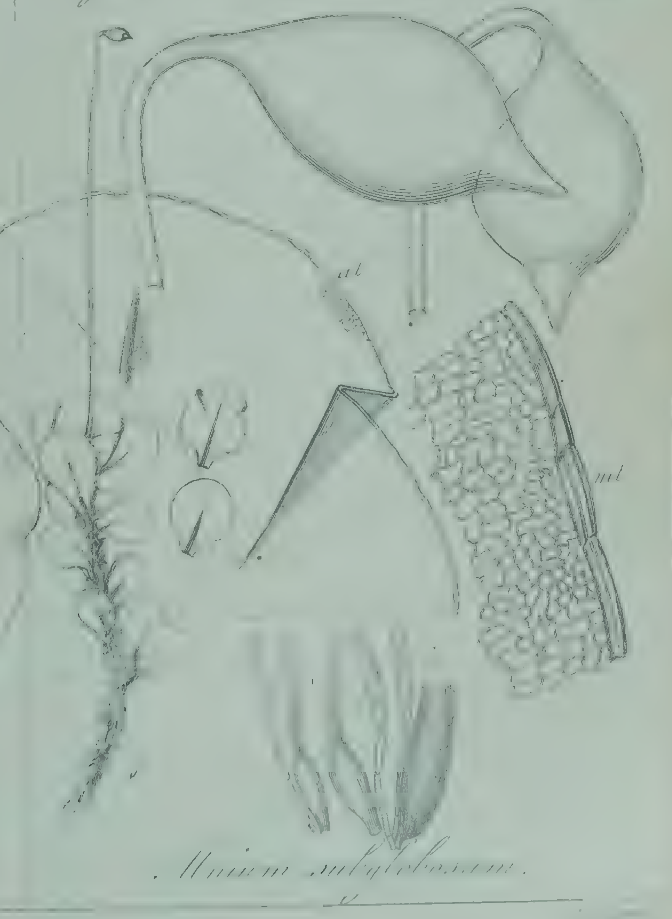


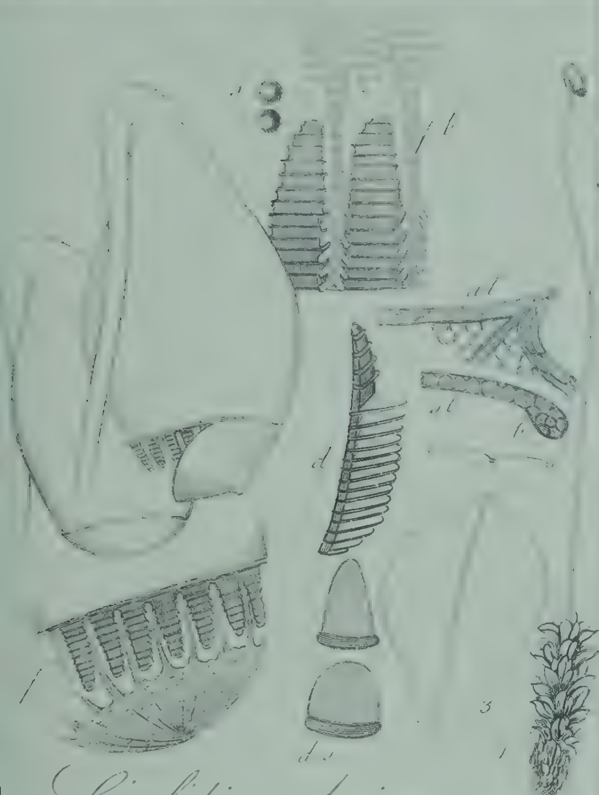
Mn. stellare.



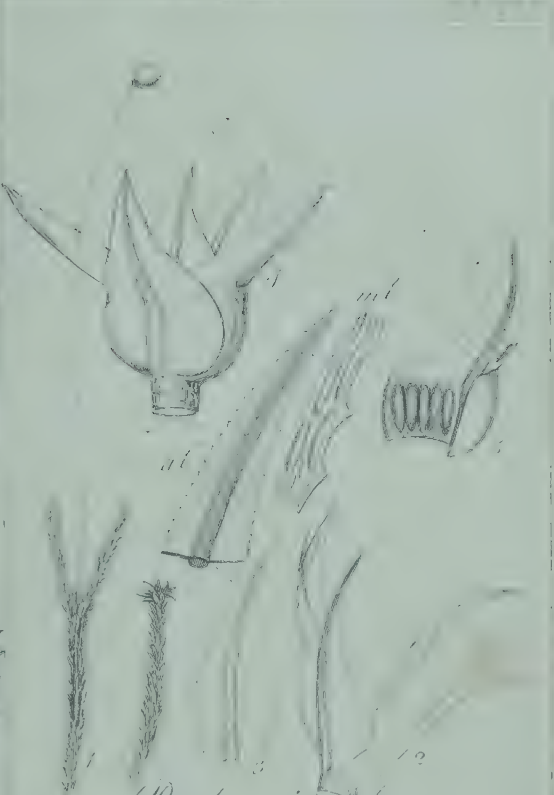
Mn. cinclidioides.



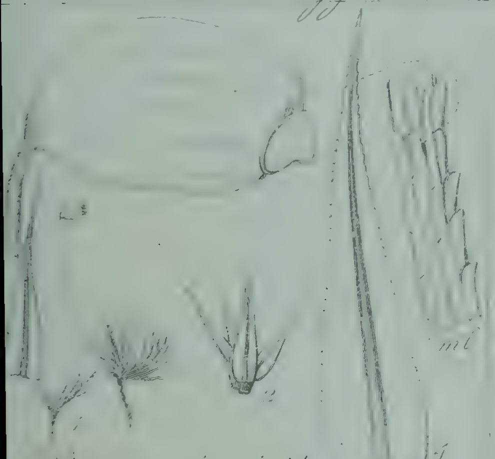
Mnium subglobosum.



Cinclidium stygium.



Bartramia calcarea.



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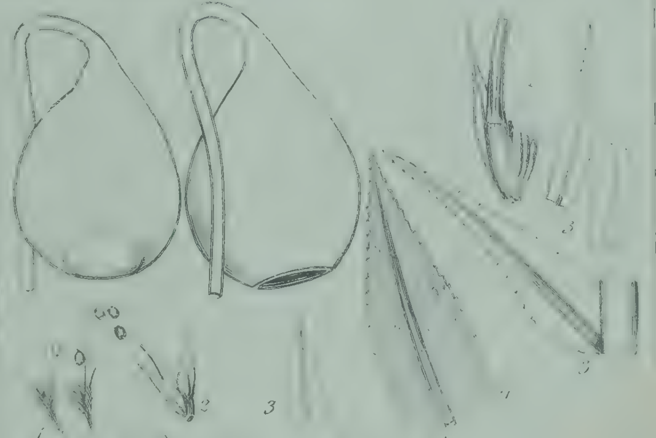
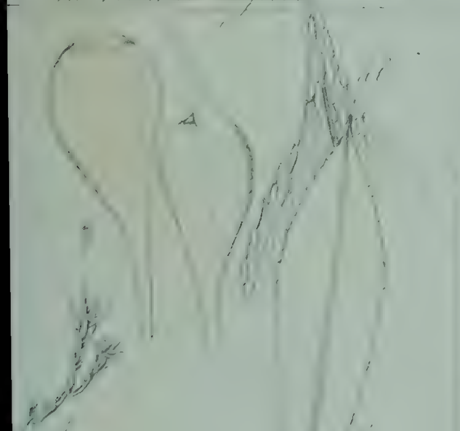
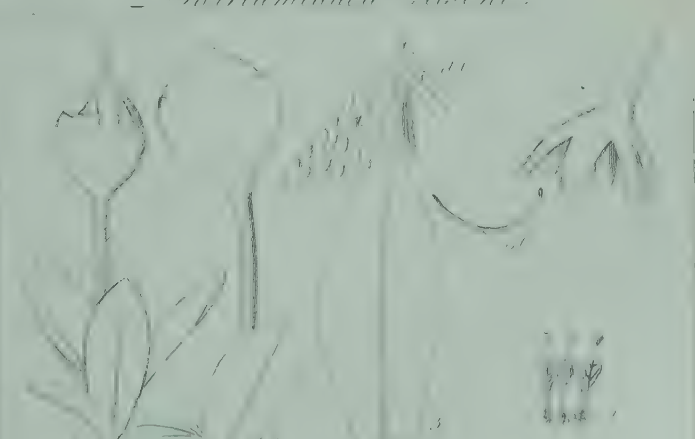


Bartramidula Wilsoni.



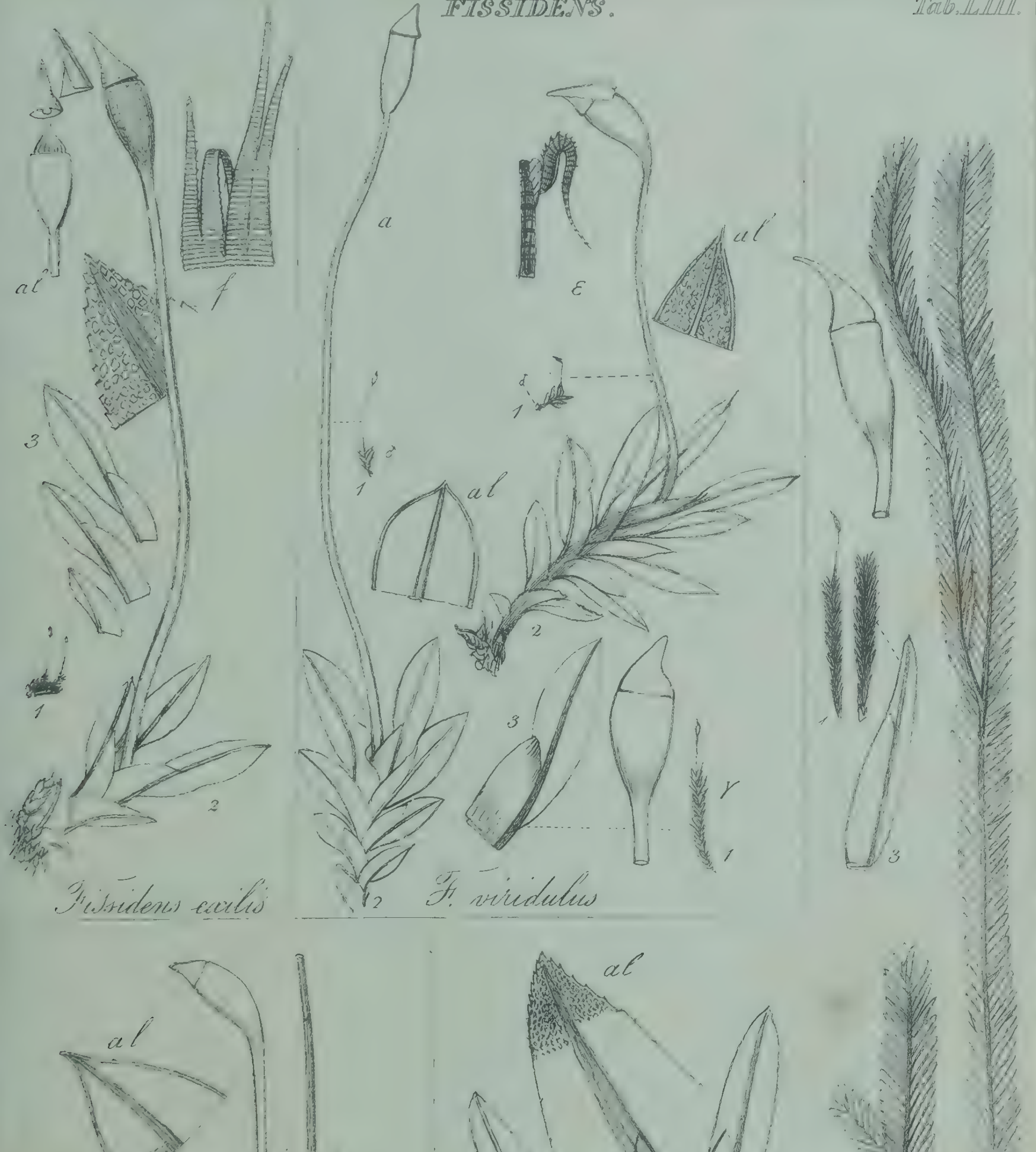
Physcomitr.m fasciculare.



Physcomitr.m sphaericum.

FISSIDENS.

Tab. LIII.

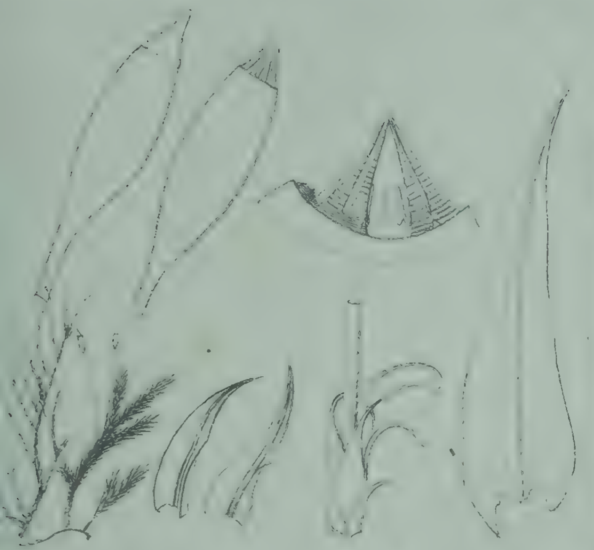


Fissidens exilis

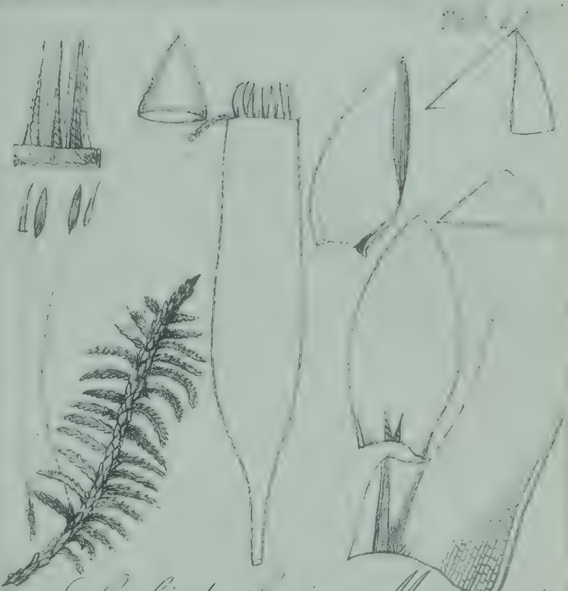
F. viridulus

F. tamarindifolius

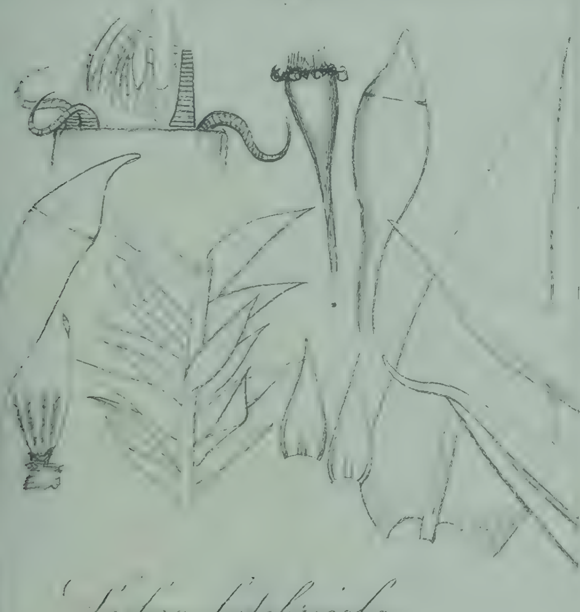
F. asplenioides var. polyphyllus.



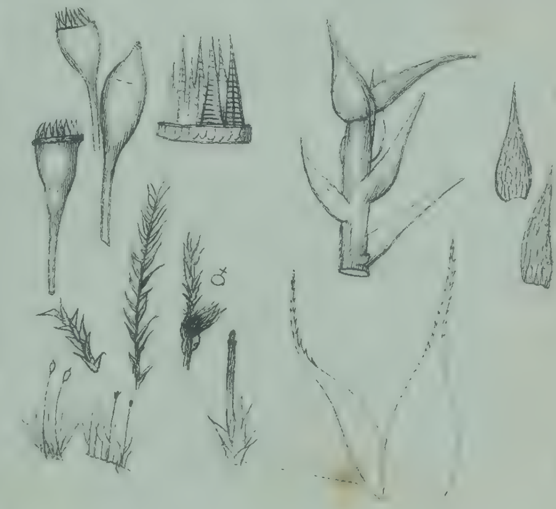
Anomodon longifolius.



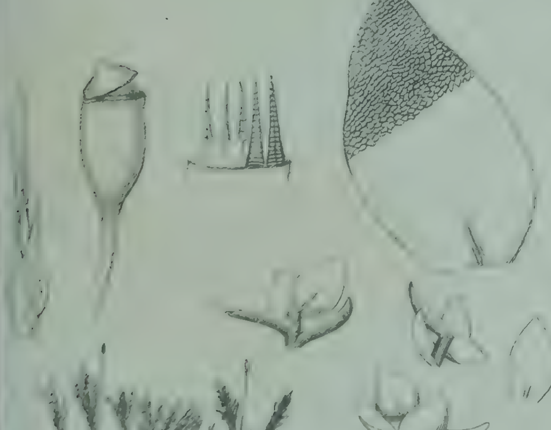
Cylindrothecium Montagnei.



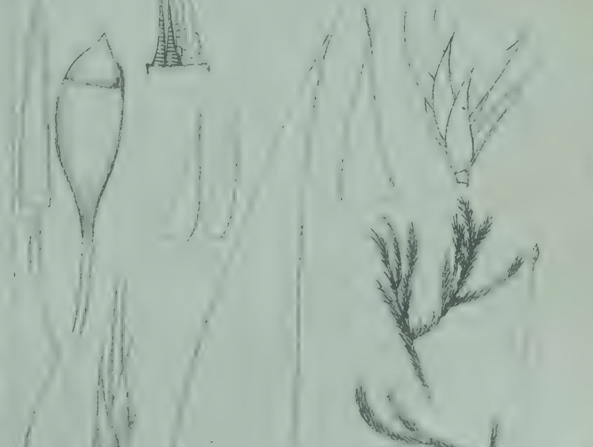
Leskea latebricola.



Leskea Sprucei.

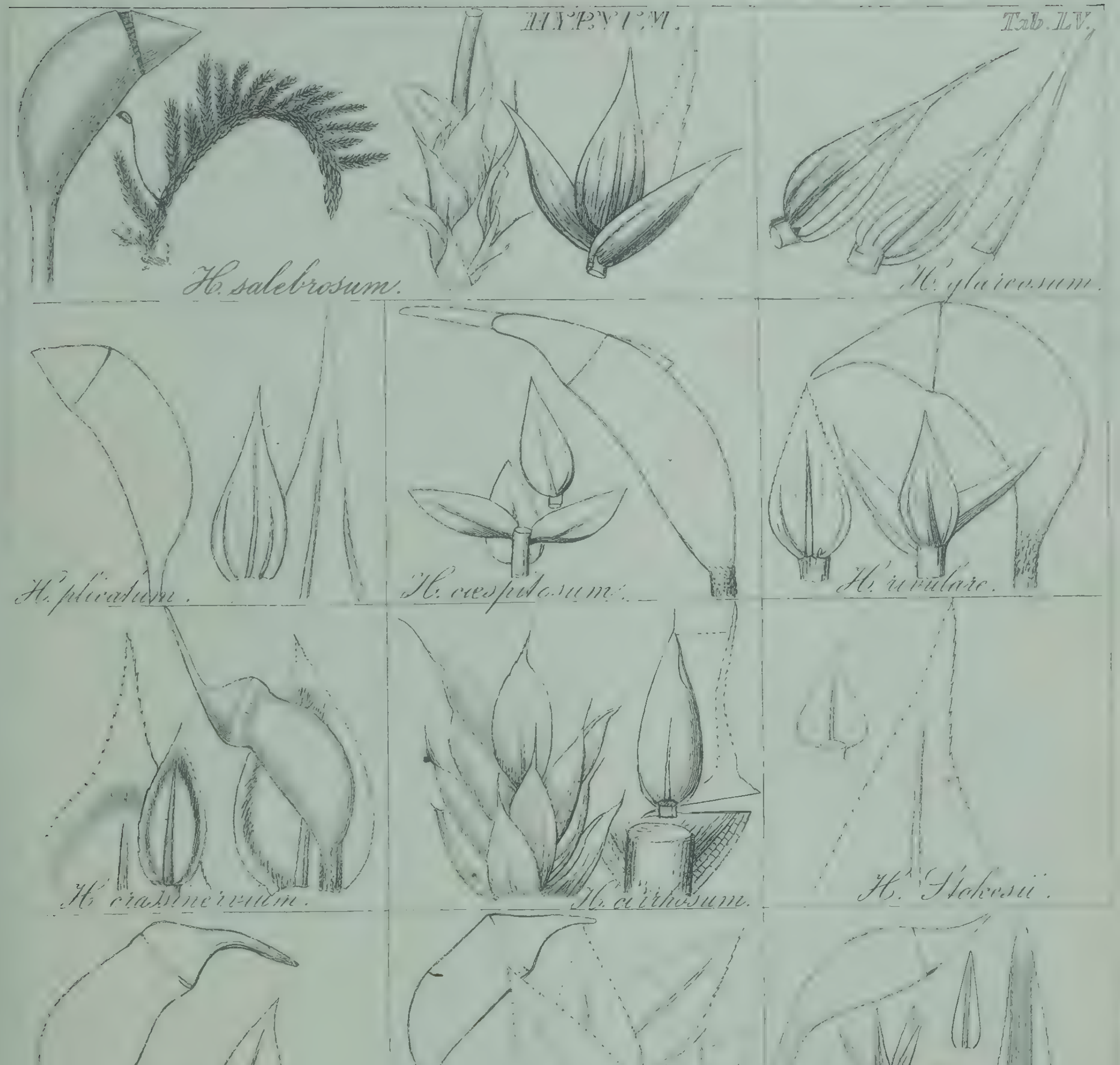


Leskea pulvinata



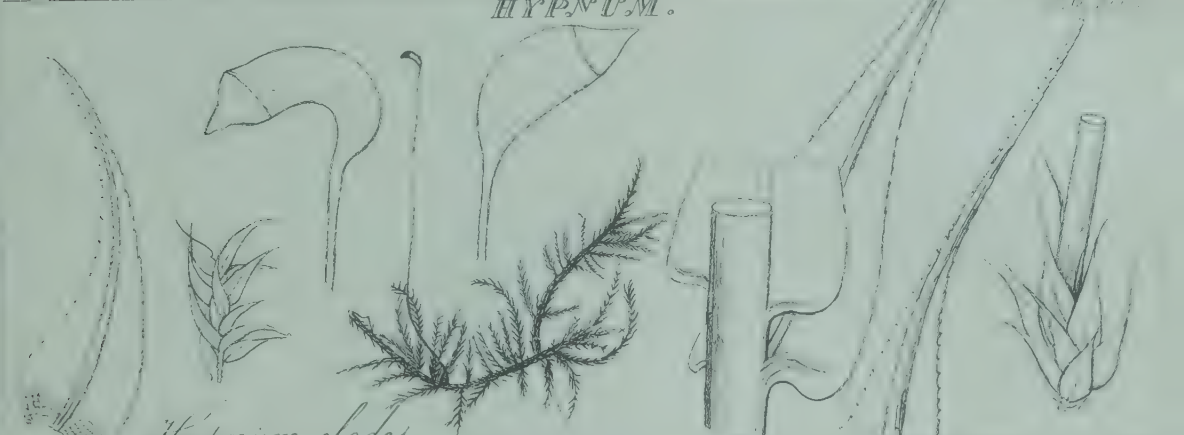
Leskea subrufa

HYPNUM. Tab. LV.

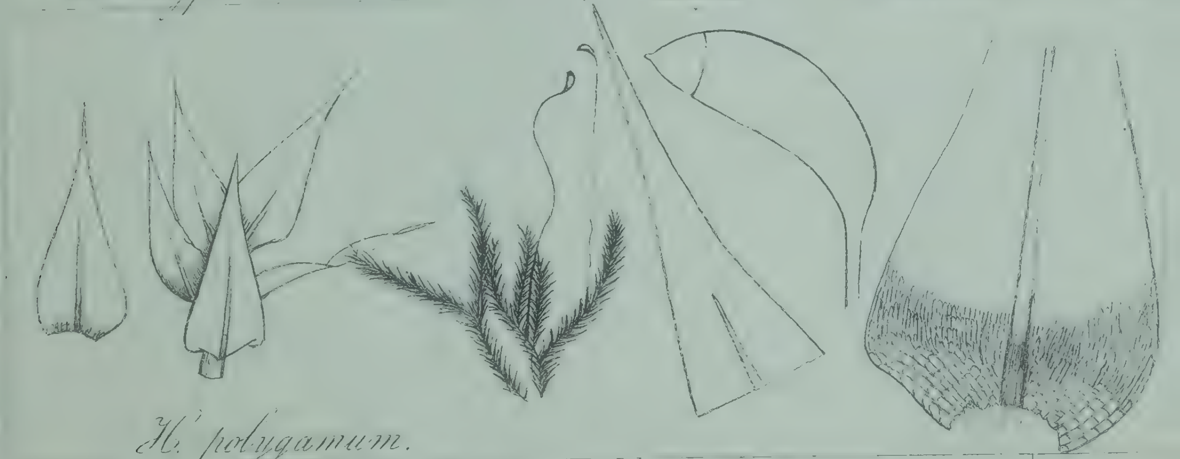

H. salebrosum.
H. glareosum.
H. plicatum.
H. caespitosum.
H. rivulare.
H. crassinervium.
H. cirrhosum.
H. Stokesii.
H. Swartzii.
speciosum.
Teesdalii.
pumilum
strigosum
catenulatum
H. striatulum.
H. circinnatum.
H. fluviatile.

H. Adlard. sc.

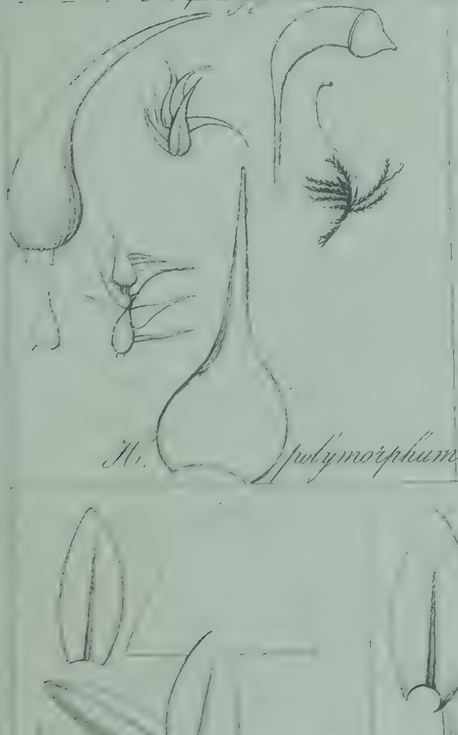
HYPNUM.



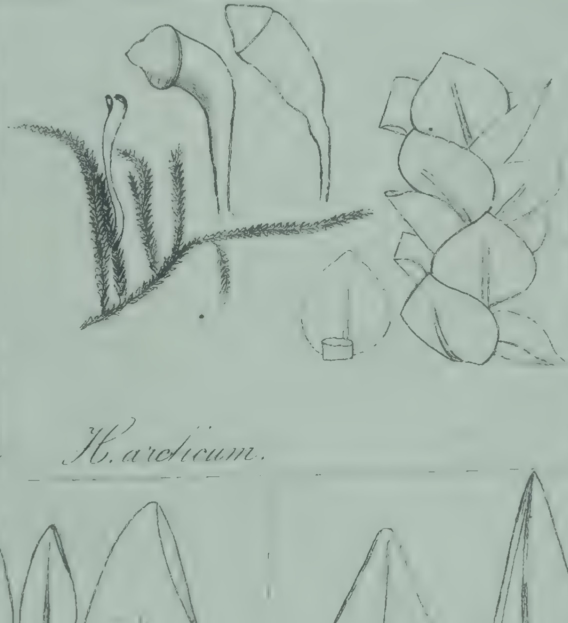
Hypnum elodes.



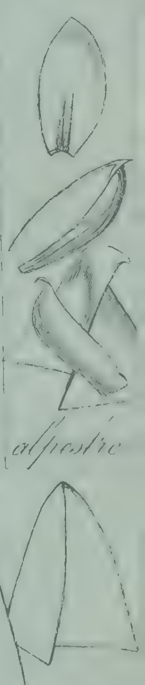
H. polygamum.



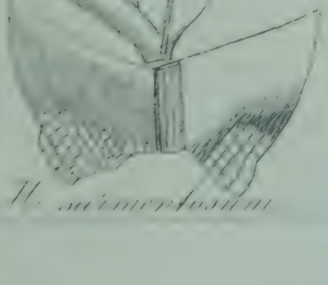
H. polymorphum



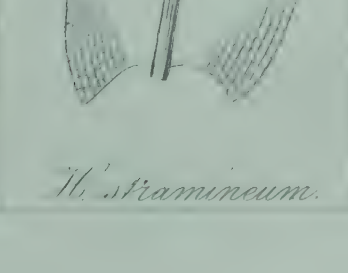
H. arcticum.



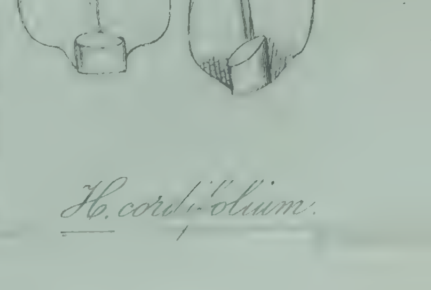
alpestre



H. sarmentosum

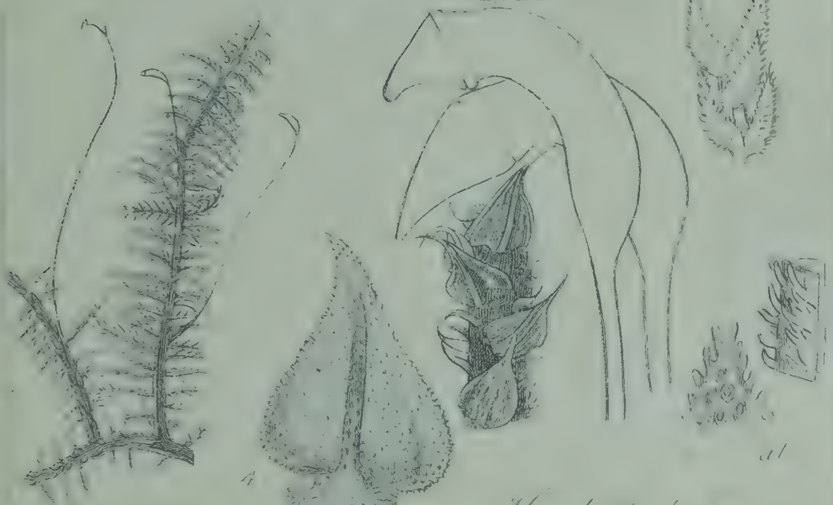


H. stramineum.

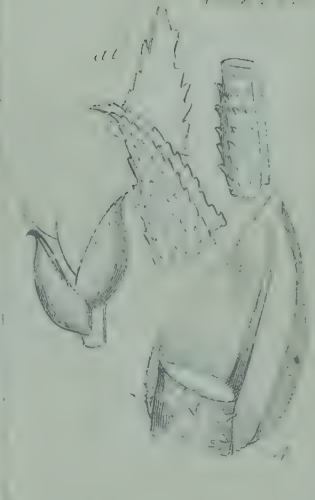


H. cordifolium.

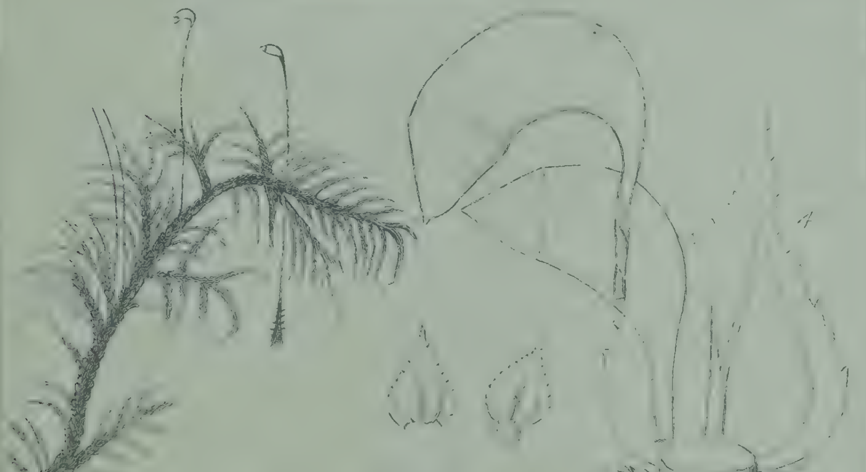
HYPNUM.



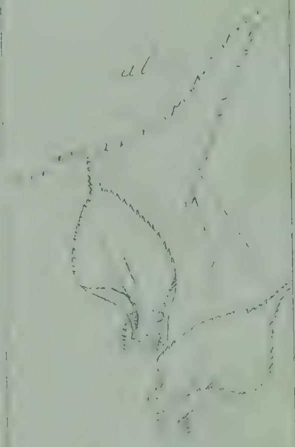
H. delicatulum



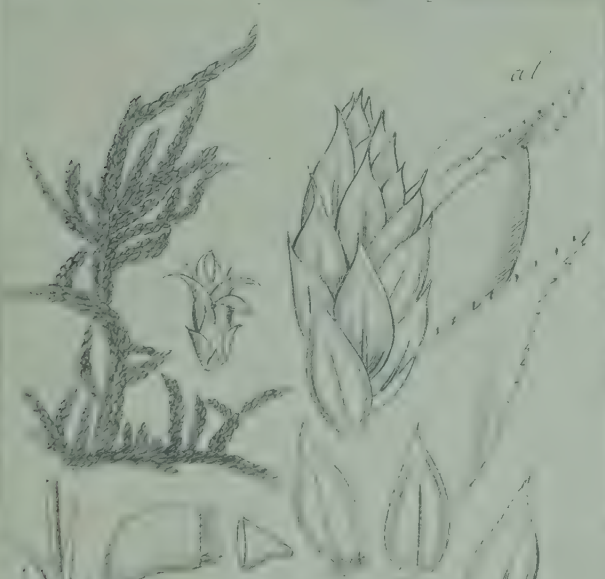
H. tamariscinum



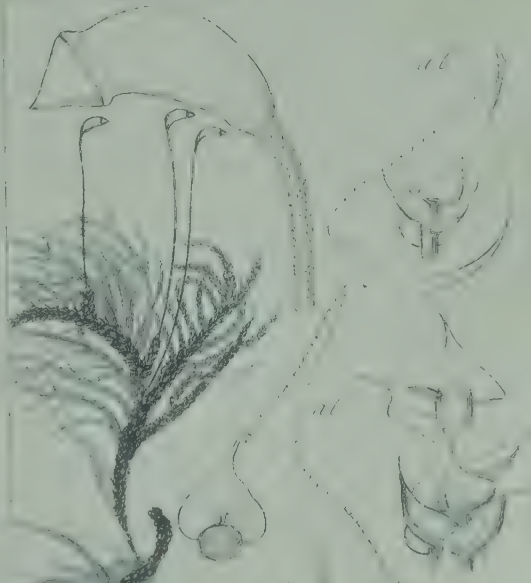
H. umbratum



H. brevirostre



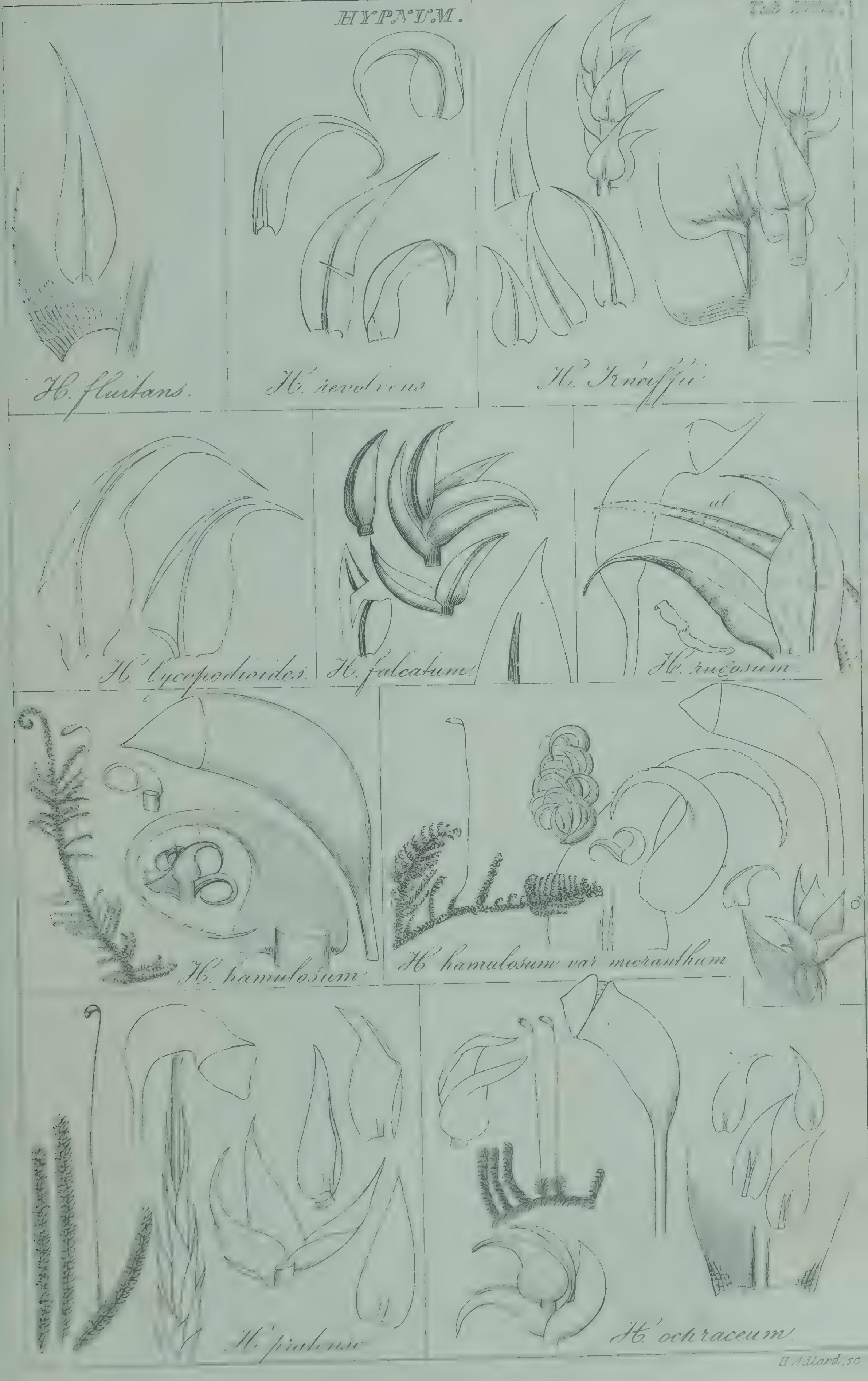
H. Oakesii.



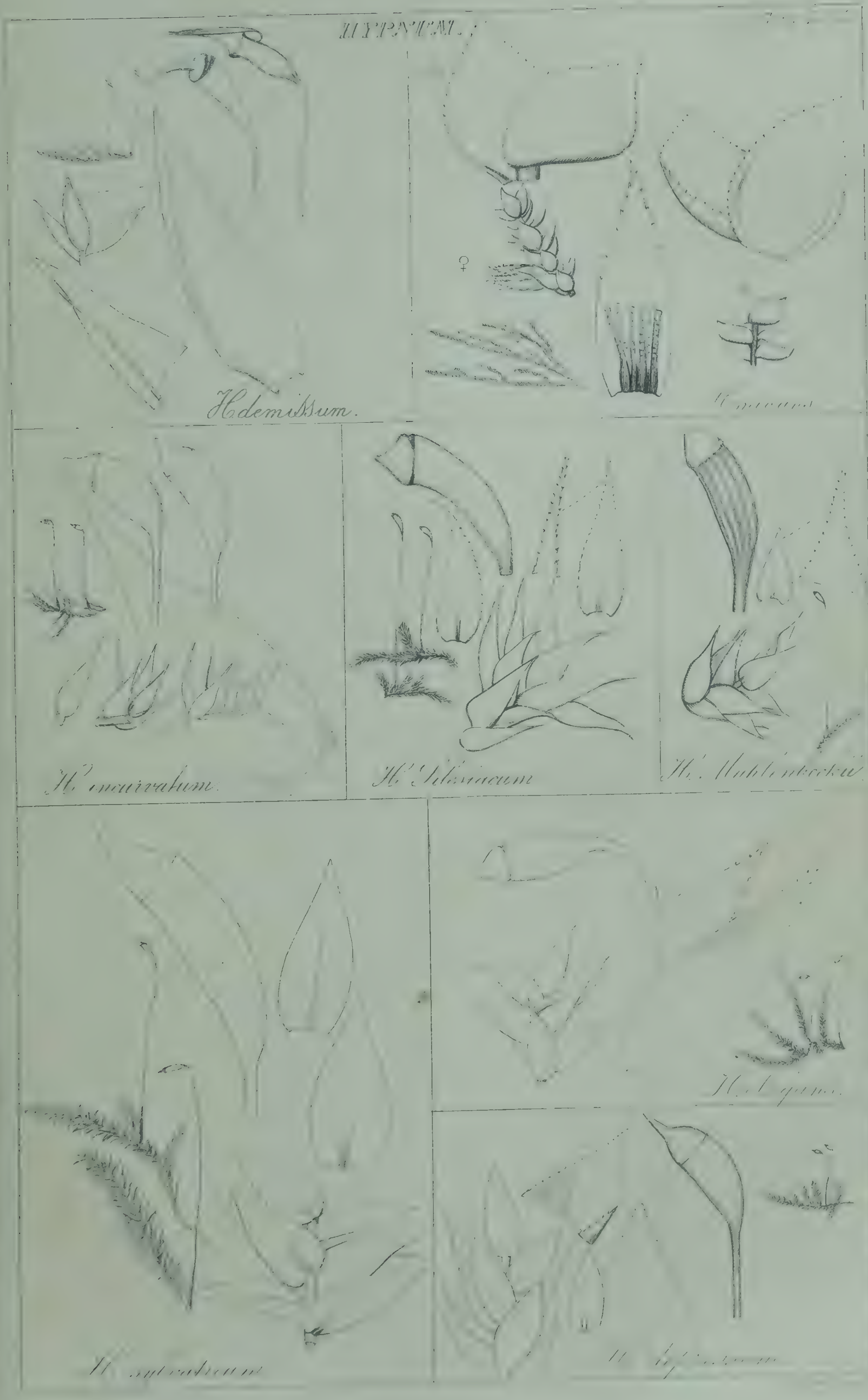
H. flagellare

HYPNUM.

Tab. LVIII.

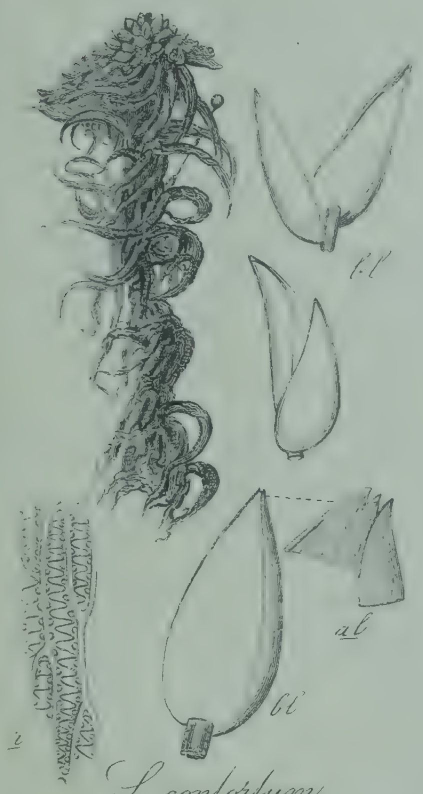

H. fluitans.
H. revolvens
H. Kneiffii
H. lycopodioides.
H. falcatum.
H. rugosum.
H. hamulosum.
H. hamulosum var micranthum
H. pratense
H. ochraceum.

H Adlard, sc

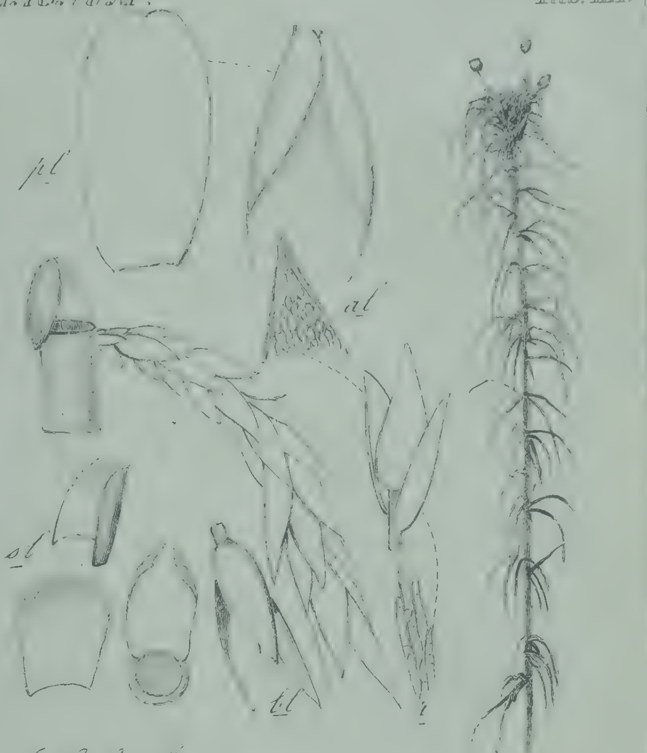

HYPNUM.
♀
H. demissum.
H. micans
H. incurvatum.
H. Silesiacum
H. Muhlenbeckii
H. umbratum
H. depressum

SPHAGNUM.

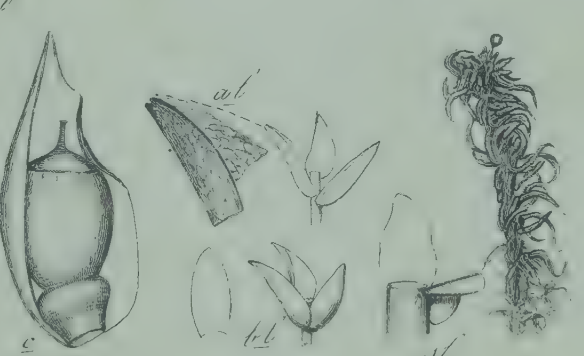
Tab. LX.



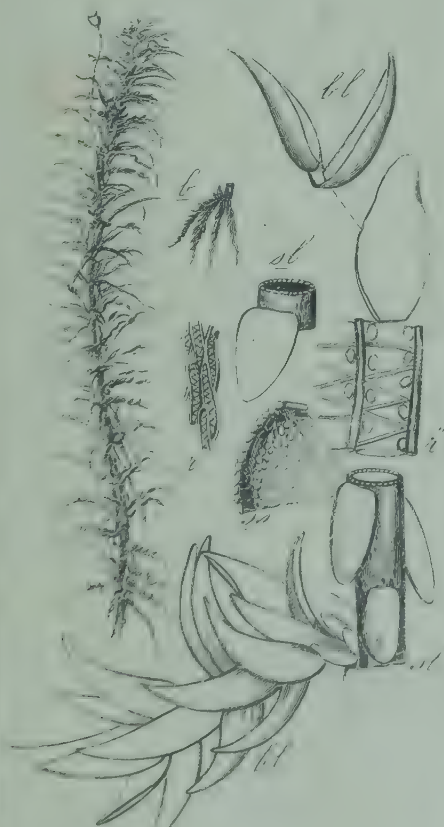
S. contortum.



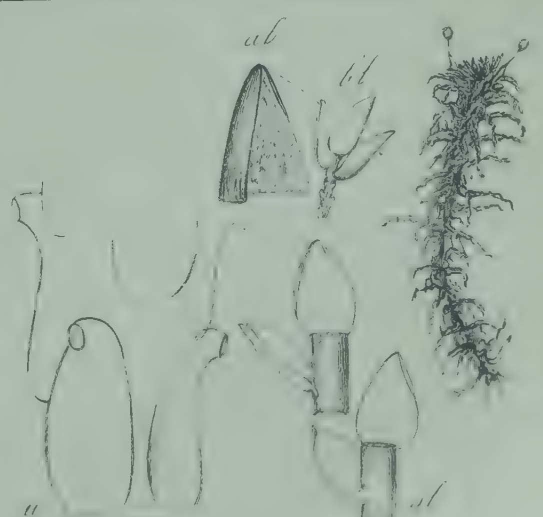
S. fimbriatum.



S. rubellum.

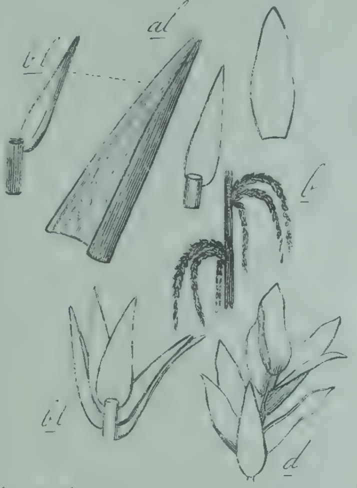


S. contortum β subsecundum.

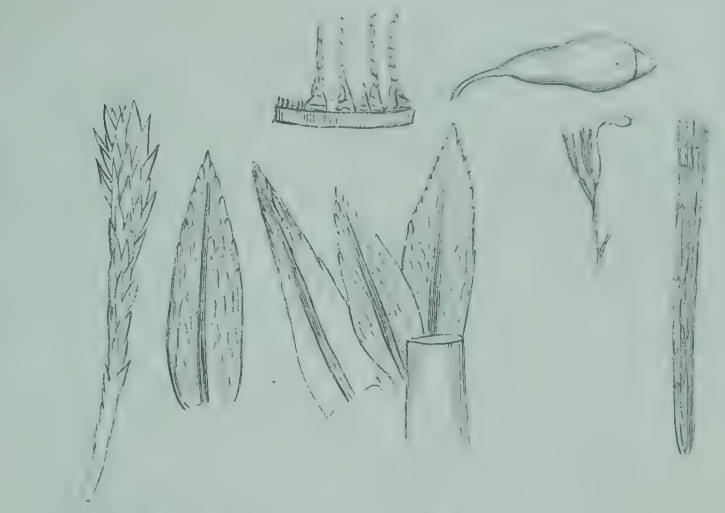


S. molluscum.

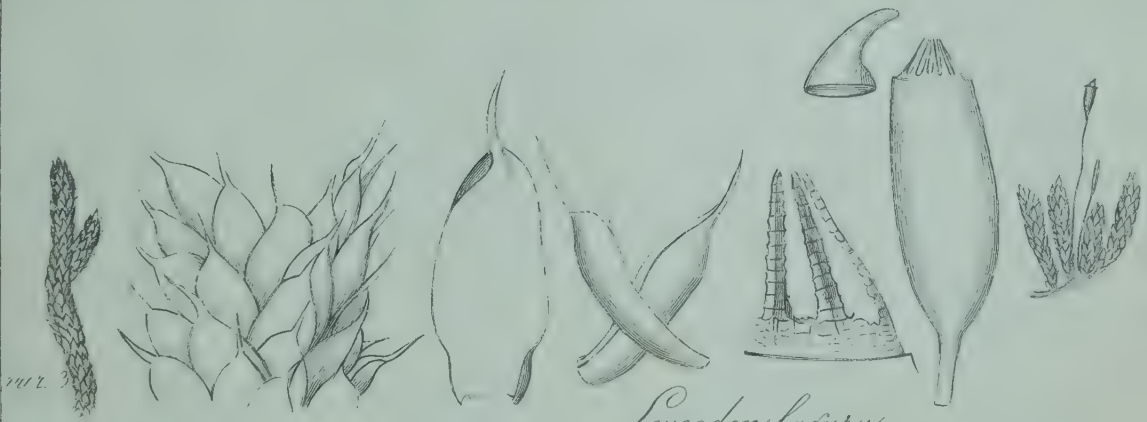
J. Adlard sc.



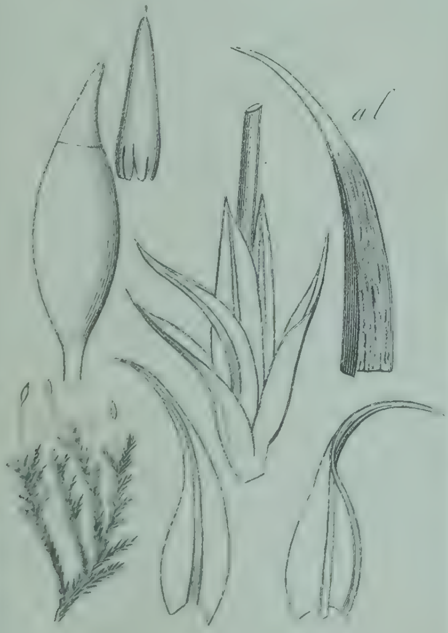
Sphagnum cuspidatum.



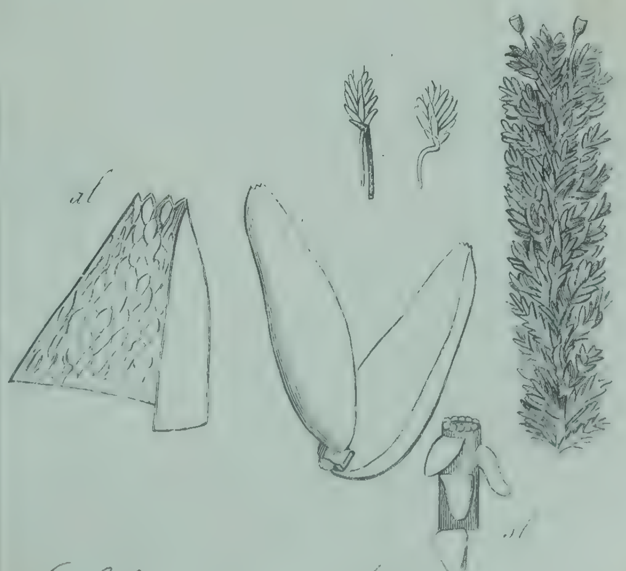
Mielichhoferia nitida δ elongata.



Leucodon lagurus.



Racomitrium microcarpon



Sphagnum compactum.

A CATALOGUE
OF
NEW WORKS IN GENERAL LITERATURE,

PUBLISHED BY
LONGMAN, BROWN, GREEN, AND LONGMANS,
39, PATERNOSTER ROW, LONDON.

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